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REPORT ON OPTIONS FOR CANADA'S NATIONAL ACTION PROGRAM ON CLIMATE CHANGE

**PRELIMINARY DRAFT
SEPTEMBER 15, 1994**

**CLIMATE CHANGE TASK GROUP
OF THE NATIONAL AIR ISSUES COORDINATING COMMITTEE**



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September 15, 1994

Dear Stakeholder:

Please find enclosed a preliminary draft *Report on Options for Canada's National Action Program On Climate Change*, dated September 15, 1994. This draft is being provided to you for your review and input into the ongoing process of preparing a final Report to energy and environment ministers in early November.

Please note that the assessment of the greenhouse gas emission reduction potential of mitigative measures and their economic impacts will be presented at the regional outreach meetings taking place during the first two weeks of October.

Possible mitigative measures have been grouped into packages for modelling scenarios in order to assess their impacts. It should be noted that this does not imply that all measures listed in this draft will be recommended or have their current definition when the final report is produced. The assessment process and comments from interested parties will likely mean changes to and/or possible deletion of some measures, as well as other modifications to the Report. The Report will also be reviewed and amended by the CCTG and its parent bodies prior to its presentation to ministers for their consideration and decision.

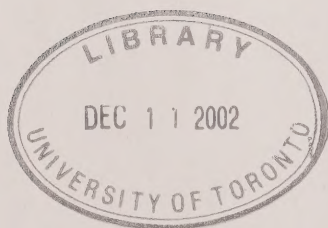
As an interested party in the climate change issue, we would appreciate your views on the draft Report, especially on the following issues: what are we doing right, and what are we doing wrong in our approach; do the options or building blocks make sense; how could the plan be improved?

We look forward to your input. If you are not attending any of the public outreach sessions, the cut-off date for all comments is October 14, 1994.

Sue Kirby
Larry Lechner,
Co-chairs, CCTG

REPORT ON OPTIONS
FOR CANADA'S
NATIONAL ACTION PROGRAM ON
CLIMATE CHANGE

PRELIMINARY DRAFT
SEPTEMBER 12, 1994



CLIMATE CHANGE TASK FORCE
OF THE NATIONAL AIR POLLUTION CONTROL COMMISSION

PREFACE

This draft *Report on Options for Canada's National Action Program on Climate Change* is the result of a request of federal and provincial environment and energy ministers to develop options to stabilize greenhouse gas emissions at 1990 levels by 2000, and to develop sustainable options for further reductions by the year 2005. It represents the collective effort of officials from federal, provincial and territorial governments, and representatives from industry associations, environmental groups and other public interest organizations. It is being presented to interested parties for further comment and input which will culminate with public workshops in early October. It will then be provided to federal, provincial and territorial Ministers of Energy and Environment in November 1994.

INTRODUCTION

THE ISSUE OF CLIMATE CHANGE

Climate change, which refers to the warming of the earth's atmosphere due to human generated emissions of greenhouse gases, and which includes carbon dioxide primarily, nitrous oxide, methane and chlorofluorocarbons (CFCs), represents a potentially significant threat to the global environment and to agricultural capacity, fish stocks, coastal structures, forest ecosystems, etc.

Of the human produced greenhouse gases, carbon dioxide (CO₂) presents the largest challenge. It is the largest contributor to global greenhouse gas emissions and arises mainly from the production and consumption of fossil fuel based energy. Gases which contribute to urban smog (NO_x, VOC) are precursors of greenhouse gases. Major sources of these other gases include: landfills, farming practices, chemical processes and fertilizers.

Projections of temperature increases and other climatic variations (e.g. storms, droughts, heat waves and cold snaps) caused by greenhouse gas emissions, indicate that there could be significant changes to Canada's natural ecosystems in the coming decades, with corresponding repercussions on our economy, lifestyles and general well-being of Canadians. Actions required to significantly reduce emissions would signify major changes in the way in which energy is produced and used with correspondingly significant changes in economic structure and lifestyles.

THE IMPORTANCE OF SCIENCE

Good scientific knowledge is a foundation for sound and effective decision making on environmental issues. Hence, where scientific uncertainty remains a significant impediment

to such decisions, the promotion of appropriate research and systematic observations to improve scientific understanding are sound investments, and an essential component of appropriate response strategies. The research called for under the Framework Convention on Climate Change and Agenda 21 is also relevant to a variety of other international and national programs aimed at reducing the risks of natural and human induced disasters.

After Russia, Canada has the world's second largest national territory. This territory includes many different climate zones, from the rain forests of its west coast to the drylands of its interior and the frozen expanses of the north. Hence, the systematic observation of Canada's climate and the investigation of climate processes particularly relevant to Canada's territory (such as those related to snow and ice, boreal forests and permafrost) are important contributions to the international efforts to improve understanding of the global climate system.

However, since the climates of Canada are integral parts of an ever-changing global system, international research on the global system is equally important to the ability of Canadians to understand climate, climate variability and climate change, and to apply such knowledge to their social and economic activities. The economic efficiency and human safety of many climate-sensitive operational decisions made regularly by individuals, by companies and by governments at all levels within Canada rely substantially upon the quality of the data and the science upon which they are based. Improved understanding of the global climate system and the related expertise in climate research will unquestionably benefit Canadians because of more effective decision making with respect to the mitigation of and adaptation to climate change. But it will also provide "spin-off" benefits for coping with current climate conditions, such as the development of operational tools for providing the public with seasonal and annual climate forecasts for use in optimisation of current socio-economic activities to climate variability and extremes.

CANADA IN THE INTERNATIONAL CONTEXT

Climate change is a global problem which calls for global solutions. Industrial nations with higher standards of living have contributed to the bulk of greenhouse gas emissions. The United States is the largest single source of greenhouse gas emissions and accounts for roughly 23% of global CO₂ emissions. Other major emitters include Russia, China, Japan and Germany. However, developing countries are expected to contribute most significantly to the growth in global emissions due to large populations, significant use of coal and other fossil fuels, and aspirations to industrialize (e.g. China and India). Canada, 11th largest emitter of greenhouse gases, accounts for roughly 2% of world emissions. As an energy intensive and affluent country, Canada has opportunities to increase its energy efficiency and is being looked to to do its share to reduce its net greenhouse gas emissions.

Canada, along with over 150 other countries, signed the Climate Change Convention in Rio de Janeiro in June 1992, to ensure cooperative international efforts to deal with the climate

change challenge. The Convention requires developed countries to report on actions with the aim of returning their emissions of greenhouse gases to 1990 levels by the end of the decade. It also provides for financial and technological assistance to developing countries.

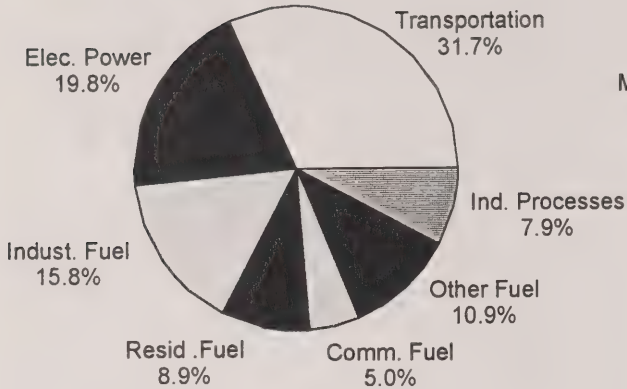
CANADA'S SITUATION

In early 1994, Canada released a *National Report on Climate Change*. This report is a useful context setting piece, as it provides information on greenhouse gas inventories, projections of emissions, mitigative actions and other relevant information.

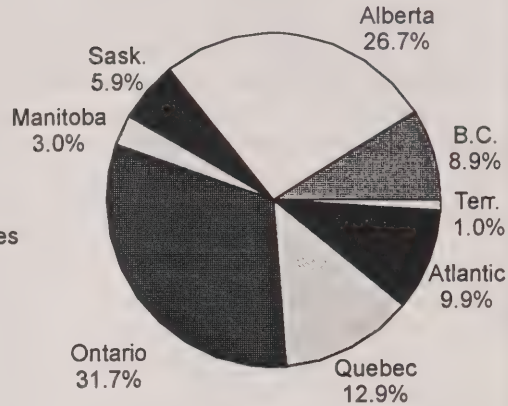
In 1990, the total amount of CO₂, CH₄ and N₂O released by human activities within Canada was equivalent to 526 megatonnes of CO₂ emissions. These emissions included 461 Mt of CO₂, most of which is accounted for by the production and use of fossil fuels.

SUMMARY of 1990 CO₂ EMISSIONS in CANADA

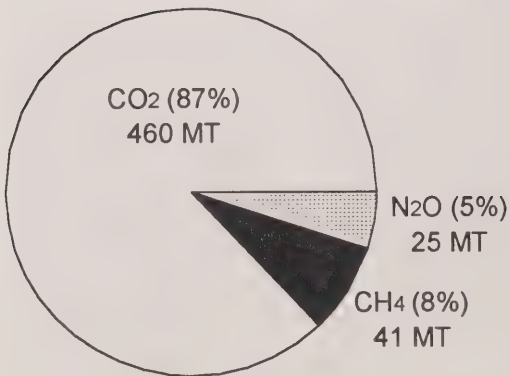
By Sector



By Province/Region



ANTHROPOGENIC EMISSIONS of GREENHOUSE GASES in CANADA 1990



Contribution of Energy (Excluding biomass) (%)

CO ₂	98
CH ₄	32
<u>N₂O</u>	<u>52</u>
All Gases	88

Estimated using 100 year Global Warming Potential (GWP)

GREENHOUSE GAS EMISSIONS BY TYPE & SECTOR

Transportation accounted for over 30% of CO₂ and over 40% of N₂O in 1990. It also contributed over 60% of NO_x and close to 45% of VOCs emissions in 1985.

Electric Power* contributed approximately 20% of Canada's 1990 CO₂ emissions and 13% of NO_x in 1985. Coal fired power stations were the major source.

In 1990, industrial facilities accounted for 16% of CO₂ & in 1985 for 14% of NO_x. 2% of Canada's CO₂ emissions were produced by cement and lime plants whereas 34% of N₂O came from chemical plants.

For residential use in 1990, fuel combustion emissions associated with heating homes and apartment buildings accounted for 9% of Canada's CO₂ emissions; while fuel combustion in offices, institutions and light industrial buildings accounted for 5%.

* In further sections of this report describing areas of opportunity, electricity use is distributed across end-users.

GREENHOUSE GAS EMISSIONS BY PROVINCE/TERRITORY

Emissions associated with transportation and heating are generally proportional to population.

Ontario was the largest source of emissions reflecting its large population and industrial base.

Alberta was the second largest source of greenhouse gas emissions in 1990. Coal-based electric generation was the main source of emissions in the province followed by transportation. Emissions associated with oil and gas production, processing and transportation to markets in Canada and the U.S., also contributed significantly to the province's emissions. Emissions associated with cement and other industrial plants were also of national significance.

The relatively low emissions per capita of CO₂ in Quebec were due to the extensive use of hydro-electricity. Accordingly the transportation sector was the major source of greenhouse gas emissions, followed by industrial fuel users. British Columbia and Manitoba displayed patterns similar to Quebec.

Saskatchewan emissions were less than those from Alberta, but did reflect similar relative contributions from the power and transportation sectors. Some emissions were also associated with oil and gas production and export.

Electric power generation was the largest source of emissions in New Brunswick and Nova Scotia with transportation as the second largest contributor. Underground coal mines in Nova Scotia were a more significant source of CH₄ emissions than surface mines in Alberta, B.C. and Saskatchewan.

CANADA'S NATIONAL EMISSIONS OUTLOOK

The key determinants of energy demand and greenhouse gas emissions over time are the level of economic growth, energy prices, energy intensity of the economy, greenhouse gas intensity of energy use, demographic trends, land use, human behaviour, government energy policies and other related policies. Canada has an energy intensive economy based largely on resource extraction. Our low population density and heavy transportation needs, our export economy, and a cold climate requiring relatively high energy consumption, all contribute to Canada's high ranking of greenhouse gas emissions on a per capita basis.

A base line "business as usual" forecast of energy demand has been developed and reviewed by peers through an emissions modelling forum of government and private sector forecasters. (See Appendix D for highlights). This outlook suggests that based on its underlying assumptions and without the National Action Program on Climate Change in place, energy related GHG emissions in 2000 will be 568Mt (CO₂ represents 518 Mt), or about 12% higher than the 1990 level.

CANADA'S RESPONSE

In the spring of 1990, federal, provincial and territorial environment and energy ministers and their officials began work on a National Action Strategy On Global Warming. In November 1990, this strategy was published in draft form. It set the policy framework for subsequent work on how to address the climate change issue. It recommended three major components: limiting greenhouse gas emissions, anticipating and preparing for climate change, and improving scientific understanding and predictive capability with respect to climate change.

With respect to the limitation component of the strategy, it was recommended that all greenhouse gases and sinks (carbon sequestration) be addressed, as well as their interactions with other atmospheric issues and pollutants. It was also noted that Canada should take action to address global warming based on internationally agreed targets and schedules, while recognizing that taking certain actions out of step with other nations would have little impact on reducing emissions globally, and could jeopardize our competitive position internationally. As well, actions to limit greenhouse gas emissions should be flexible, adaptable over time to new information and developments, and should recognize the importance of regional differences.

This Report on Options for a National Action Program on Climate Change is framed with the strategic directions set out by the earlier National Action Strategy in mind.

In November 1993, federal and provincial ministers of environment and energy met to discuss climate change. They provided the base mandate to officials for the development of responses, and instructed them to report back to ministers in November 1994.

The Charge from Ministers

Federal and provincial/territorial ministers of environment and energy at their joint meeting in November 1993 instructed officials to "proceed with the development of options that will meet Canada's current commitment to stabilize greenhouse gas emissions by the year 2000 and to develop sustainable options to achieve further progress in the reduction of emissions by the year 2005".

FRAMEWORK AND PRINCIPLES

FRAMING THE POSSIBILITIES

In choosing options or measures to mitigate climate change there are many factors which need to be considered and balanced. These include greenhouse gas emission reduction potentials, and the economic, social and political considerations outlined in the *Canada's Response, Principles and Approach* sections discussed in this Report. In summary:

- Environmental considerations include: the impact on greenhouse gas emissions and other cross cutting environmental benefits (e.g. reduced smog or other harmful emissions), largest returns for investment, enhancing sustainable development, and research and development benefits associated with longer term solutions.
- Economic considerations include: the positive and negative impacts of measures from a sectoral and regional perspective, and impacts on the economy as a whole in terms of gross domestic product, employment, competitiveness and trade.
- Social considerations include the quality of life and well being, acceptability of lifestyle changes, and a consensus that the problem is serious enough to warrant significant change.
- Political considerations include: the issue of sectoral and regional equity in terms of the impact of measures, jurisdictional responsibilities, partnerships, competing priorities, and fiscal constraints.

PRINCIPLES FOR A NATIONAL ACTION PROGRAM

Options to achieve greenhouse gas stabilization and further reductions to 2005 need to take into account the following principles:

- **Proportionality**

No regions or sectors should be disproportionately disadvantaged by actions taken to control climate change.

- **Shared Responsibility**

Actions to address climate change need to be taken by all levels of government - federal, provincial and municipal - and by the private sector and the general public.

- **Effectiveness**

The Action Program needs to effectively reduce net greenhouse gas emissions.

- **Least Cost Solutions**

Least cost measures should be taken first. The overall Action Program should be cost effective.

- **Competitiveness and Job Creation**

Actions should maintain or improve Canada's competitiveness abroad and its job market at home.

- **Comprehensiveness**

All greenhouse gases need to be considered in emission control strategies as will all sinks.

- **Integrated Approach**

Consideration should be given to those actions which help solve other environmental problems or have other social or economic benefits.

- **Transparency/Accountability**

Interested parties are able to understand who is responsible for taking specified actions, what action is being taken, and the expected impacts of that action.

- **Adaptability/Flexibility**

A wide range of responses should be encouraged and the action program should evolve over time as experience is gained, technologies develop and scientific evidence becomes

more certain. Lack of scientific certainty should not be used to postpone measures that are cost effective or justified for other reasons.

- **Maximize Partnerships with other Countries**

Actions should be adopted which work to maximize innovative and cooperative solutions with our major trading partners and minimize negative competitive impacts of action by ensuring they are internationally coordinated.

- **Fiscal Responsibility**

The Action Program should be developed bearing in mind the state of the economy and concerns with deficit reduction.

- **Timing**

The program should include early action and sustained results in terms of net emissions.

THE APPROACH

The options to address climate change have been developed through a multi-partite process involving government, private sector, environmental and other interest group representatives. Wherever possible, consensus was sought, given the realization that the problem of climate change requires responses from many parties. Given the diverse positions of stakeholders on many suggested responses to climate change, consensus was not always possible. Nevertheless, the initiatives outlined in this *Report on Options for a National Action Program on Climate Change* are designed to allow decision-makers to choose measures for implementation in conformity with principles and criteria outlined earlier. It is also acknowledged that measures will be implemented according to their practicability, given the circumstances of the responsible party.

A sequential approach has been followed in determining the development of mitigative measures. Packages have been developed as described in the Recommendations Section, along a continuum. Emission reduction potentials are then estimated and the results are grouped into options as requested by ministers.

Firstly, options are recommended to achieve stabilization of greenhouse gas emissions at 1990 levels by the year 2000. Secondly, options are examined to achieve progress beyond 2000, including reducing emissions by 2005. Some options to achieve progress beyond 2000 may be stronger versions of measures identified to achieve stabilization by that year. Given the costs and/or societal adjustments required for many mitigative measures, and some of the scientific uncertainties associated with predicting the degree of climate change, a precautionary and phased approach in implementing corrective action is preferred. This

approach recognizes that adjustments and uncertainties should not be an excuse for inaction, but that actions which are cost effective and beneficial for economic, environmental and other reasons should be undertaken.

It should be noted that there are many mitigative programs and measures which help reduce greenhouse gas emissions already in place. Many of these measures have to do with increasing energy efficiency and thereby reducing CO₂ emissions. Such measures have been relatively inexpensive and cost effective over the planning horizon of companies, governments and individuals who have implemented them. There remain cost-effective opportunities to expand on these initiatives and improve energy efficiency in other areas. The size of these opportunities remains the subject of extensive debate. Beyond those initiatives, however, many next step or additional measures, although effective at reducing emissions, nevertheless, may be contentious for economic, social and political reasons, and will likely need more time, changed economic circumstances, education and compromise to achieve broader support.

Some measures have been identified in this report that are ready for implementation with relative ease, as well as those which require further examination and development. The latter may have large greenhouse gas emission reduction potentials, but high economic and social costs associated with them. Moreover, their design is often complicated, and agreement on their benefits and costs has yet to be achieved. It should not be overlooked, however, that many mitigative responses will present not only environmental benefits, but also opportunities for employment, technological advances and increased business competitiveness. Despite efforts to overcome implementation barriers in the description of these measures, much remains to be done. Nevertheless, these measures are of sufficient importance that work on them should continue.

The options included herein encompass eight measures which cut across sectors (so called foundation measures) such as a broadly-based challenge to undertake voluntary actions and measures directed at changing prices and changing behaviour through education and communication. However, the vast majority of the measures are organized on a sectoral basis. This allows for very detailed and specific design. Moreover, it makes it possible to relate actions to sources of emissions and hence to measure and review progress.

AREAS OF OPPORTUNITY FOR MITIGATIVE MEASURES

It should be noted that climate change cannot usually be addressed directly in terms of "end of pipe" technological solutions which directly control greenhouse gas emissions. In addition, it should be noted that what may be technologically feasible may not be feasible when the considerations outlined earlier are factored into the decision-making process.

RESIDENTIAL SECTOR

The residential sector includes any dwelling of three stories or less. This sector contributes to greenhouse gas (GHG) emissions through the combustion of fossil fuels, primarily to meet space and water heating requirements. In 1990 these emissions amounted to about 9% of total national CO₂ emissions. The residential sector also contributes indirectly to GHG emissions through electricity consumption provided by fossil fuel based generation. In total, this sector accounts for about 15% of Canada's total CO₂ emissions.

In general, three areas of opportunity in the residential sector which present some promise are:

- Improve thermal performance of new dwellings - 875,000 new housing starts are projected between 1995 and 2000.
- Institute thermal upgrades to existing housing - about 62% of existing housing stock was built before 1970.
- Improve the energy efficiency of equipment in households (e.g. space and water heating, major appliances, lighting).

COMMERCIAL SECTOR

The commercial sector includes private and public/quasi-public institutional buildings (e.g. office buildings, high-rise apartment buildings, hospitals, schools, etc.). This sector also contributes to GHG emissions from the combustion of fossil fuels, mainly for space heating requirements. When combined with electricity used for lighting, ventilation, air conditioning and equipment, this sector is responsible for about 10% of CO₂ emissions.

Areas of opportunity in the commercial sector likewise have to do with increasing energy efficiency for heating, ventilation, air conditioning, lighting and equipment. They are:

- Improve the thermal shell of new and existing buildings to reduce heat or cooling loss and improve the energy efficiency of lighting and other equipment.
- Develop district heating and cooling systems and use of combined heat and power sources.

INDUSTRIAL SECTOR

The industrial sector includes the manufacturing, mining, construction and forestry related industries. Energy use within this sector is dominated by process-specific requirements such as movement of materials, mechanical processes, process heating and cooling, and physical/chemical transformation. Fossil fuel consumption in this sector is responsible for about 16% of total CO₂ emissions. When electrical use based on fossil fuel generation is added, the sector accounts for about 25% of Canada's total CO₂ emissions.

The industrial sector is also a significant contributor of NO_x, N₂O (especially from chemical plants) and PFCs from aluminum smelters. Areas of opportunity to reduce emissions in the industrial sector lie mainly in the following areas:

- Improve the efficiency of mechanical processes (e.g. crushing, grinding, compressing, etc.).
- Use more efficient equipment for boilers and hot air furnaces, electric motors and driven equipment (pumps, blowers, compressors, etc.), as well as efficient lighting.
- Use waste heat recovery, cogeneration, and electroheat technologies (e.g. microwave and ultrasonic drying).

TRANSPORTATION SECTOR

The transportation sector is composed of road, rail, marine, air and off-road vehicle modes of transportation and is dependant on fossil fuels such as gasoline and diesel. Transportation accounts for about 30% of CO₂ equivalent greenhouse gas emissions in Canada, and of the total, by far the largest amount of emissions (78%) came from on-road transportation.

Areas of opportunity, to a large extent, are determined by the technical and economic feasibility of new technology, and the time required to make modal shifts. Some of them are:

- Influence individual vehicle and fleet users, as to their vehicle and fuel choices, driving habits and vehicle maintenance.
- Encourage greater use of more efficient commuting transportation modes (bus, subway and railway transit) and reduce traffic congestion.
- Pursue opportunities for utilization of cleaner fuels.

ENERGY PRODUCTION AND SUPPLY SECTOR

This sector is comprised of the extraction and distribution of crude oil, natural gas and coal as well as the transmission of electrical power, net of sales (i.e. emissions have already been attributed to other sectors based on their demand for power). In previous sectors, electricity has been distributed across end-uses to make clearer the areas of opportunity. In terms of actual measures, this section includes ones related to improved efficiency of electricity production and transmission per se, as opposed to more efficient use of electricity and other fuels at the point of consumption). The upstream energy production and supply industry directly contributed about 13% of Canada's CO₂ equivalent emissions in 1990 (mainly methane).

Areas of opportunity are largely influenced by the availability of cost-effective new technologies and market demand for fuel choices.

Some opportunities are:

- Improve the efficiency of fuel and power production and transmission.
- Methane capture in exploration and production of oil, gas and coal.

NON-ENERGY SECTOR

INDUSTRIAL SOURCES AND SINKS

Non-energy sector industrial sources contributed about 6% of total greenhouse gas emissions on a CO₂ equivalent basis in 1990. These are gases such as methane (CH₄) from waste landfills and coal mines, polyfluorocarbons (PFCs) from aluminum smelters, and substitutes for chlorofluorocarbons (CFCs) such as HFCs and HCFCs, which have greater greenhouse warming potentials than CO₂.

Carbon dioxide is also released in the manufacturing of cement.

Areas of opportunity are:

- Reduce emissions from waste landfills.
- Take preventative actions to control GHG emissions in the manufacturing process, and sequester CO₂.

FORESTRY SOURCES AND SINKS

Forests act as a natural sink for sequestering CO₂ during the growth cycle of trees. In a natural state, there is an equilibrium between CO₂ being released through decaying trees and being absorbed by living trees. To the extent that trees are harvested without

reforestation, or forest land is converted to other uses, the former forested lands no longer are neutral in the carbon cycle. Trees can act as sinks for CO₂ when they add to the existing inventory of forested land.

Areas of opportunity are:

- Greater reforestation efforts, and afforestation in urban and rural settings.

AGRICULTURE

Agriculture production practices contribute to greenhouse gas emissions and have the potential to enhance carbon sequestering. Opportunities exist to increase the annual photosynthetic conversion of CO₂ into organic matter and to reduce the amount of emissions of greenhouse gases associated with agricultural operations.

Areas of opportunities are:

- Reduction in soil tillage and summerfallow acreage which will increase soil carbon storage.
- Increased efficiency of nitrogen fertilizer and use of livestock manure.

AREAS OF OPPORTUNITY FOR ADAPTATION

Climate adaptation measures are those which are undertaken in anticipation of future conditions or events, and which promote long term and sustainable adjustments to climate. They are comprised of measures to adjust behaviour, actions or decisions which will help reduce vulnerability to the effects of climate change. Adaptation measures have been categorized as foundation, strategic and tactical measures.

Areas of opportunity are:

- Promote research, public information and education on adaptation.
- Altering agricultural, forestry and water resource practices so that they anticipate and are more tolerant to climate change.

BARRIERS TO ACHIEVING BEHAVIORAL CHANGE

Even when a potential measure to reduce emissions satisfies most of the criteria outlined in the *Principles* section, there may still remain barriers to implementation which need to be acknowledged and addressed.

For example, the pricing of fuels and energy is a key determinant in motivating investments in energy efficiency and fuel switching. Relatively low prices for energy and fossil fuels on a historical basis, work as a disincentive to energy efficiency and switching to alternative fuels.

Even if prices are such as to make a particular investment attractive, investors may be unaware of cost-effective opportunities, or unwilling to invest in new processes and technologies, and alternatives to doing business as usual because of perceived risks. Moreover, the cost of energy is only a small part of total production costs for many industries and therefore investment priorities lie elsewhere. Also, it is often difficult for Canadian manufacturers to adopt new or higher efficiency standards for their products, or components thereof, if the cost of doing so makes them uncompetitive within the North American market.

In the commercial and residential sectors, often the nature of development, ownership and operation of buildings present barriers to investments in energy efficiency. Builders tend to focus on keeping initial construction costs low, and therefore do not invest in energy saving building techniques and equipment because energy costs will be passed on to tenants. Home owners often will not make investments in energy efficiency, which usually have long payback periods, because of uncertainty of their plans to reside at the residence until their investment costs are recouped, or fear that they will not capture their initial investment in the resale market.

Finally, even when mitigative measures are economically attractive and supported for other reasons, the lack of supportive infrastructure currently in place (e.g. trained tradespeople) may mean delays in implementing desired changes. Moreover, institutions, whether they be public or private, need time to restructure or change the way they operate and make decisions.

The many considerations outlined above help explain the choice of options to address climate change presented herein. The measures which have been included have attempted to take these barriers into account.

RECOMMENDATIONS (yet to be developed)

NOTE:

After the assessment of impacts from the following packages of measures have been completed, options will be recommended to ministers for achieving greenhouse gas emissions stabilization by 2000 and further reductions to 2005. Some of the policy initiatives for governments require expanding existing programs, new spending and fiscal measures, as well as utilizing regulations. It is also recommended that governments establish an overall framework for voluntary initiatives undertaken by the private and public sectors to reduce emissions. It is necessary to establish the criteria for, and facilitate the reporting of such voluntary initiatives.

The groupings of measures which follow are to facilitate modelling scenarios for assessment purposes. Recommendations to ministers have yet to be developed. Details of all measures can be found in Appendix A.

MODELLING SCENARIO # 1

This package includes measures supported by participants in the multi-stakeholder process to date. It consists of measures to be used as a building block, onto which other potential measures would be added. While playing a critical role in the NAPCC, this building block, in and of itself, is unlikely to meet the stabilization goal.

While some details concerning the nature of the suggested measures may undergo change as they are refined for implementation (and these details may influence the ultimate support for the package), these measures have been put forward as ones which have a high degree of voluntary compliance, can be implemented relatively easily and quickly, generally are low cost initiatives, and involve most sectors and key stakeholders.

However, the scope and nature of these measures are such that their impacts on greenhouse gas emissions are difficult to determine, especially by the year 2000. This is due to variables such as the interdependence of some measures with others for effectiveness, the rate of market penetration of measures, and longer lead times required for the cumulative effects of changes to consumer behaviour and business investment to be felt.

MODELLING SCENARIO # 1 MEASURES are as follows:

- | | |
|-----|--|
| F.1 | VOLUNTARY CLIMATE CHALLENGE INITIATIVE |
| F.2 | NATIONAL REGISTRY OF MITIGATIVE ACTIONS |
| F.3 | NATIONAL COMMUNICATION & MOTIVATION INITIATIVE |
| 1.1 | FACILITATE NATIONAL BUILDING ENERGY EFFICIENCY CODE ADOPTION |

- 1.2 PROMOTE EE MORTGAGES FOR RESIDENTIAL BUILDINGS
- 1.3 HOME ENERGY RATING (new homes)
- 1.4 NATIONAL BUILDER TRAINING PROGRAM (residential)
- 1.7 ENHANCED FINANCING MECHANISM FOR HOME ENERGY RETROFIT
- 1.8 HOME ENERGY RATING (existing homes)
- 1.10 RENOVATION/RETROFIT TRAINING PROGRAM
- 2.2 FACILITATE NATIONAL ENERGY CODE FOR NEW COMMERCIAL BUILDINGS
- 2.3 PROMOTE EE MORTGAGES FOR COMMERCIAL BUILDINGS
- 2.4 NATIONAL BUILDER TRAINING PROGRAM (new commercial buildings)
- 2.7 NATIONAL BUILDER TRAINING PROGRAM (retrofit commercial bldgs.)
- 2.8 EXPAND FEDERAL BUILDING INITIATIVE
- 2.9 EXPAND ENERGY INNOVATORS INITIATIVE
- 3.1 ESTABLISH INDUSTRIAL EFFICIENCY INDICATORS
- 3.2 PROMOTE BENCHMARKING/BEST PRACTICES FOR INDUSTRY
- 3.3 INDUSTRIAL ENERGY INNOVATORS PROGRAM
- 3.4 PROMOTE ELECTRIC DRIVEPOWER CHALLENGE
- 4.1 EXPAND STANDARDS FOR APPLIANCES & ENERGY USING EQUIPMENT
- 4.2 LABELLING APPLIANCES & ENERGY USING EQUIPMENT
- 4.3 IMPLEMENT GOLDEN CARROT PROGRAM
- 5.7 INSTITUTE FLEET PROCUREMENT & MANAGEMENT PROGRAM
- 5.22(A) STRONGER ENFORCEMENT OF EXISTING HIGHWAY SPEEDS
- 6.1 ELECTRIC UTILITY CLIMATE CHANGE CHALLENGE PROGRAM
- 6.3 ELECTRIC UTILITY SUPPLY SIDE EFFICIENCY IMPROVEMENTS
- 6.5 ELECTRICITY & HEAT COGENERATION OPPORTUNITIES
- 6.6 INVESTIGATE ELECTRICITY GENERATION FUEL SWITCHING
- 6.10 UPSTREAM OIL & GAS ENERGY EFFICIENCY IMPROVEMENTS
- 6.11 METHANE REDUCTION - UPSTREAM OIL & GAS
- 6.12 METHANE REDUCTION - DOWNSTREAM GAS DISTRIBUTION
- 6.16 DEVELOP RENEWABLE ENERGY INFRASTRUCTURE
- 7.1 REDUCE EMISSIONS FROM WASTE LANDFILLS
- 7.3 CONTROL EMISSION OF HFCS
- 7.5 REDUCE EMISSIONS FROM ADIPIC ACID PLANT
- 7.13 REDUCTION IN METHANE EMISSIONS FROM RUMINANT FARM ANIMALS
- 7.14 REDUCTION IN EMISSIONS OF METHANE AND CARBON DIOXIDE FROM LIVESTOCK MANURE

- 7.15 REDUCTION IN EMISSIONS OF GHG ASSOCIATED WITH PRODUCTION OF MINERAL NITROGEN FERTILIZERS
- 7.16 REDUCTION IN FOSSIL FUEL USAGE FOR FARM OPERATIONS

MODELLING SCENARIO # 2

This scenario focuses on public regulatory initiatives in addition to voluntary actions by the private sector. This scenario includes MS #1 measures, as well as implementing new, more challenging mitigative measures. Scenario # 2 is expected to have incremental impacts on emissions and more certainty associated with its effects.

These measures may require additional costs on the part of governments, institutions, businesses and consumers. On the other hand, many of these measures may work to enhance Canada's competitive advantage in environmental industries and provide opportunities for savings through increased energy efficiency for Canadians.

The measures for MODELLING SCENARIO # 2 are as follows:

Measures from MODELLING SCENARIO # 1 (see above) plus,

- F.4 ESTABLISH A JOINT IMPLEMENTATION (JI) INITIATIVE (non-quantitative at this stage)
- 1.5 CREATE NATIONAL LOW INCOME ENERGY EFFICIENCY RETROFIT PROGRAM
- 1.6 ESTABLISH RETROFIT BUILDING STANDARDS (residential)
- 2.5 ESTABLISH RETROFIT BUILDING STANDARDS (commercial)
- 2.6 IMPROVE FINANCING MECHANISMS FOR COMMERCIAL RETROFITS
- 3.5 ESTABLISH BOILER & KILN EFFICIENCY STANDARDS
- 3.6 TAX INCENTIVE FOR ELECTRICAL EFFICIENCY AND PROCESSES
- 5.2 NATIONAL URBAN VEHICLE INSPECTION & MAINTENANCE PROGRAM
- 5.14 ENCOURAGE TELECOMMUTING & ALTERNATIVE WORK STRATEGIES
- 5.15 IMPROVE CYCLING & WALKING ENVIRONMENT
- 5.16 INCREASE TRANSIT RIDERSHIP
- 6.2 ELECTRIC UTILITY INTEGRATED RESOURCE PLANNING
- 6.7 EVALUATE INCREASED AVAILABILITY OF EXISTING HYDRO AND/OR NUCLEAR GENERATION CAPACITY

- 6.9 LOW EMISSION GENERATION CAPACITY
- 6.13 INTEGRATED RESOURCE PLANNING FOR GAS UTILITIES
- 6.15 STIMULATE RENEWABLE ENERGY MARKETS
- 6.17 ENCOURAGE UTILITY USE OF RENEWABLE ENERGY
- 6.18 MORE R&D TO ACCELERATE DEVELOPMENT OF RENEWABLE ENERGY TECHNOLOGIES
- 7.2 REDUCE METHANE EMISSIONS FROM COAL MINES
- 7.4 REDUCE EMISSIONS FROM ALUMINUM SMELTERS
- 7.7 PROMOTE TREE PLANTING IN URBAN & AGRICULTURAL SETTINGS
- 7.8 SUBSTITUTE WOOD FOR STEEL & CONCRETE IN BUILDINGS

MODELLING SCENARIO # 3

These measures focus on the use of economic instruments and increased public expenditures in meeting GHG emission goals. They are additional to measures from the preceding scenarios and have greater impacts on greenhouse gas emission reduction as well as on the economy. They also imply large expenditures and lifestyle changes.

The measures for MODELLING SCENARIO # 3 are as follows:

Measures from MODELLING SCENARIOS # 1 AND 2 (see above) plus,

- F.5 REMOVAL OR REDIRECTION OF SUBSIDIES (Parking subsidy reform)
- F.8 CREATE A MOTIVATION FUND TO SUPPORT MEASURES
- 1.9 ESTABLISH NATIONAL GREEN COMMUNITIES PROGRAM
- 2.1 ACCELERATE APPLICATION OF DISTRICT ENERGY SYSTEMS
- 5.4 VEHICLE FEEBATE
- 5.5 VEHICLE RETIREMENT (SCRAPPAGE PROGRAM)
- 5.6 VEHICLE FUEL EFFICIENCY PREMIUM
- 5.8 IMPROVE VEHICLE FUEL EFFICIENCY STANDARDS
- 5.9 INCREASE MOTOR FUEL TAXES AND PRICES
- 5.10 PROVIDE INCENTIVES FOR ALTERNATE FUELS (Includes 7.17)
- 5.13 PROMOTE INCREASED DENSITY IN URBAN AREAS
- 5.18 PROMOTE FULL COST ROAD PRICING
- 5.19 PROMOTE FULL COST PARKING & PARKING MANAGEMENT
- 5.20 DEVELOP HIGH SPEED RAIL SYSTEMS FOR HIGH DENSITY CORRIDORS
- 5.21 ENHANCE PASSENGER & RAIL SERVICE COMPETITIVENESS

- 5.22(B) LOWER HIGHWAY SPEEDS
- 6.14 DEVELOP SUPPORTING GOVERNMENT POLICIES FOR RENEWABLE ENERGY

MODELLING SCENARIO # 4

This scenario contains the majority of measures in the previous modelling scenarios, but increases the intensity of some of the measures or groups of measures (i.e. higher standards, incentives, taxes, etc.) in order to increase greenhouse gas reduction potential.

The measures for MODELLING SCENARIO # 4 are under development.

MODELLING SCENARIO # 5

This scenario is a stand alone package of measures designed not only to achieve stabilization, but also reduction of emissions in the post 2000 period. It is a coherent package of measures, building on and reinforcing measures over a longer time horizon, with further reductions aimed for 2005. Most of the measures in this scenario are at a higher intensity level than in scenarios 1 to 3, and are likely to have significant socio-economic and environmental implications.

The measures for MODELLING SCENARIO # 5 are as follows:

NOTE:

For purposes of analysis, measures indicated by (**) do not lead directly to specific CO₂ reductions; and unless otherwise noted with a footnote, the version of the measure as interpreted by CCTG's Forecasting Working Group (FWG) should be used. Where a different interpretation, or a stronger 'intensity' version of the measure is called for, the footnote indicates the changed assumptions for use in analysis.

- F.1 **VOLUNTARY CLIMATE CHALLENGE INITIATIVE
(not including those measures listed below which are voluntary and may already be part of this initiative)
- F.2 **NATIONAL REGISTRY OF MITIGATIVE ACTIONS
- F.3 **NATIONAL COMMUNICATION & MOTIVATION INITIATIVE
- F.4 **JOINT IMPLEMENTATION OF MITIGATIVE MEASURES

- F.5 REMOVAL OR REDIRECTION OF SUBSIDIES¹
- F.6 **ASSESS A HARMONIZED CONTINENTAL CARBON CHARGE
- F.7 **DESIGN A TRADEABLE PERMITS SYSTEM

- 1.1 FACILITATE ADOPTION OF NATIONAL BUILDING ENERGY EFFICIENCY CODE
- 1.2 PROMOTE EE MORTGAGES FOR RESIDENTIAL BUILDINGS²
- 1.3 HOME ENERGY RATING (new homes)
- 1.4 NATIONAL BUILDER TRAINING PROGRAM (residential)
- 1.5 CREATE NATIONAL LOW INCOME ENERGY EFFICIENCY RETROFIT PROGRAM³
- 1.6 ESTABLISH RETROFIT BUILDING STANDARDS (residential)
- 1.7 ENHANCED FINANCING MECHANISM FOR HOME ENERGY RETROFIT
- 1.8 HOME ENERGY RATING (existing homes)
- 1.9 ESTABLISH NATIONAL GREEN COMMUNITIES PROGRAM
- 1.10 RENOVATION/RETROFIT TRAINING PROGRAM

- 2.1 ACCELERATE APPLICATION OF DISTRICT ENERGY SYSTEMS ⁴
- 2.2 FACILITATE ADOPTION OF NATIONAL ENERGY CODE FOR NEW COMMERCIAL BUILDINGS
- 2.3 PROMOTE EE MORTGAGES FOR COMMERCIAL BUILDINGS
- 2.4 NATIONAL BUILDER TRAINING PROGRAM (new commercial buildings)
- 2.5 ESTABLISH RETROFIT BUILDING STANDARDS (commercial)
- 2.6 IMPROVE FINANCING MECHANISMS FOR COMMERCIAL RETROFITS
- 2.7 NATIONAL BUILDER TRAINING PROGRAM (retrofit commercial bldgs.)

¹ In 1996/97 Natural Resources Canada (NRCan) megaproject financing of \$287 Million/yr expires. Assume half goes to deficit reduction, and half goes to expand renewables programs & Canmet & PERD funding. Assume that by 1998 50% of all PERD funds is allocated to renewables and efficiency (including the 'supercar'). Assume 25% of all Canmet funding is allocated to commercialization of renewables by 1998.

² CMHC offers preferred mortgage insurance rate for energy efficient houses.

³ Assume: envelope and water heating efficiency improve by 15%. Second element of program: All social housing agencies currently paying energy costs of tenants undertake efficiency and water retrofits. ESCO financed, multi-unit buildings, average 25% saving.

⁴ This will be made easier in the electric NUG sector outlined below. Assume expansion of Ottawa and Toronto projects by 2005.

- 2.8 EXPAND FEDERAL BUILDING INITIATIVE⁵
- 2.9 EXPAND ENERGY INNOVATORS INITIATIVE⁶
- 3.1 ESTABLISH INDUSTRIAL EFFICIENCY INDICATORS
- 3.2 PROMOTE BENCHMARKING/BEST PRACTICES FOR INDUSTRY
- 3.3 INDUSTRIAL ENERGY INNOVATORS PROGRAM⁷
- 3.5 ESTABLISH BOILER & KILN EFFICIENCY STANDARDS
- 3.6 TAX INCENTIVE FOR EE INDUSTRIAL PROCESS INVESTMENTS⁸
- 4.1 EXPAND STANDARDS FOR APPLIANCES & ENERGY USING EQUIPMENT⁹
- 4.2 LABELLING APPLIANCES & ENERGY USING EQUIPMENT
- 5.1 NATIONAL GREEN TRANSPORTATION STRATEGY¹⁰
- 5.2 NATIONAL URBAN VEHICLE INSPECTION & MAINTENANCE PROGRAM

⁵ Assume energy savings of 35% per building.

⁶ Specifically, provincial and municipal governments launch ESCO-driven Municipal/Provincial Buildings Initiatives and retrofit 50% of their buildings by 2005. Assume 30% energy saving per building.

⁷ Assume half of expense taken on by gas and electric utilities.

⁸ Restore Class 34 treatment for renewable electricity options (25/50/25) as per pre-'94 budget.

⁹ Assume that Canadian standards increase in line with the U.S. at the same time as standards increase in the U.S.

¹⁰ The cost of this provincially administered fund would be offset through a combination of one or more of the following: 1. Shift of federal, provincial and municipal highway and road funds (Commission study on Passenger Transportation: \$5 billion a year, including \$1.5 billion in environmental damages. Does not include subsidies for freight: \$726 million for grain transportation; \$100 million for freight in Atlantic Canada. Just using passenger subsidies = \$1.25 billion); 2. Full-cost road pricing and parking, and 3. Increases in the federal excise tax on gasoline. Federal and provincial governments eliminate subsidized parking in 1995. The fund would be to a maximum of \$2 billion by 2005. This measure does not directly produce CO₂ reductions, but generates funds which are used to support other measures listed elsewhere, which produce reductions.

- 5.4 INSTITUTE NATIONAL VEHICLE FEEBATE PROGRAM¹¹
- 5.7 INSTITUTE FLEET PROCUREMENT & MANAGEMENT PROGRAM¹²
- 5.8 IMPROVE VEHICLE FUEL EFFICIENCY STANDARDS¹³
- 5.9 INCREASE MOTOR FUEL TAXES AND PRICES¹⁴
- 5.10 PROVIDE INCENTIVES FOR ALTERNATE FUELS¹⁵
- 5.12 **IMPLEMENT R&D PROGRAMS FOR ADVANCED VEHICLE
TECHNOLOGIES
- 5.13 PROMOTE INCREASED DENSITY IN URBAN AREAS
- 5.14 ENCOURAGE TELECOMMUTING & ALTERNATIVE WORK STRATEGIES
- 5.15 IMPROVE CYCLING & WALKING ENVIRONMENT
- 5.16 INCREASE TRANSIT RIDERSHIP
- 5.17 PROMOTE RIDESHARING
- 5.18 PROMOTE FULL COST ROAD PRICING
- 5.19 PROMOTE FULL COST PARKING & PARKING MANAGEMENT

¹¹ Rescreen using a feebate rate of \$400/L/100km above or below fleet average.

¹² No documentation provided from FWG. Assume here Green Fleets model used by International Council for Local Environmental Initiatives (ICLEI) and the U.S. (See assumptions under C) and that the program is used to establish a financing pool for bulk purchasing of best-in-class, fuel-efficient vehicles among governments and the corporate sector.

Assume the focus to 2000 is on Canada's ten largest cities representing 67 per cent of transportation emissions and that federal, provincial and municipal governments participate in the fleet procurement and management program by 2000; 20 per cent cities and Montreal and Edmonton do so by 1995. Participants agree to allocate a 25 percent of purchases to ultra-efficient vehicles by 2000.

¹³ Reanalyse assuming 5L/100km by 2005 for cars and 6.5 L/100km for light trucks by 2005.

¹⁴ Assume increase in the federal excise tax on gasoline in the 1995 budget equivalent to maintain relative spread between U.S. and Canadian prices that was in place before the U.S. imposed its gasoline/BTU tax and the Canadian dollar fell in relation to the U.S. dollar.

¹⁵ Assume a 10 per cent ethanol blend is achieved by 2005. Assume a mix of grain and ligno-cellulose-based ethanol provides 5% net reduction in CO₂ (Canadian Renewable Fuels Association for a 10/90 blend using current production methods.) Assume federal excise tax exemption nationally and provincial sales tax exemptions in Ontario and British Columbia until 2005.

- 5.20 DEVELOP HIGH SPEED RAIL SYSTEMS FOR HIGH DENSITY CORRIDORS¹⁶
- 5.21 ENHANCE PASSENGER & RAIL SERVICE COMPETITIVENESS¹⁷
- 5.22(A) STRONGER ENFORCEMENT OF EXISTING HIGHWAY SPEEDS
- 6.1 ELECTRIC UTILITY CLIMATE CHANGE CHALLENGE PROGRAM
- 6.2 ELECTRIC UTILITY LEAST COST PLANNING¹⁸
- 6.8 INCREASED NON-UTILITY GENERATION¹⁹

¹⁶ Assume Quebec/Windsor corridor using a French TGV system built by Bombardier and is in place by 2005. NOTE: A study by the High Speed Rail Task Force estimates a cost of \$6 billion; \$2 billion to government. Financing would be as outlined in measure 5.1 to a maximum of \$2 billion.

¹⁷ No estimate or documentation from FWG: Assume the federal government exempts rail from right-of-way property payments beginning in 1996. Assume gross weight allowances for trucks is reduced to U.S. standards by 2000 (80,000 lbs. versus 140,018 - 102,533 in Canada). Assume truck efficiencies improve 25 per cent by 2005 and that 50 per cent of trucks are using alcohol fuels.

¹⁸ We use here the "regulatory reform" version from the Measures Working Group (MWG) catalogue, in which utilities are allowed by regulators to make a profit on energy efficiency investments, rather than losing profits as they largely do now, and that regulators would expect the utilities to meet customers needs with the least cost combination of supply and efficiency resources. This establishes a market-driven incentive for the utilities to pursue customer DSM and internal energy efficiency.

Assume 1/3 of all load growth between 1995 and 2010 is met by efficiency improvements (including internal supply-side); assume this has no net cost. As a result of measure 6.8 below, assume 1/3 of all new supply (and replacement/retired capacity) comes from high efficiency gas industrial cogeneration at cost effective market prices (ie. no net cost). Also assume that 3/4 of the gas involved is already being burned. Assume that 1/6 of the load growth comes from competitive renewables (small hydro, wind and wood waste cogen-the wood should be treated as no net CO₂). Assume the last 1/6 of the load comes from zero-CO₂ policy-induced renewable supply such as photovoltaics, wind, small hydro, etc. For measure cost here assume a 2c/kwh premium.

¹⁹ We modify this measure to be END UTILITY MONOPOLY OVER GENERATION. The consequences of this for screening appear above as part of least cost planning measure 6.2. This measure now

- 6.10 UPSTREAM OIL & GAS ENERGY EFFICIENCY IMPROVEMENTS
- 6.11 METHANE REDUCTION - UPSTREAM OIL & GAS
- 6.12 METHANE REDUCTION - DOWNSTREAM GAS DISTRIBUTION
- 6.13 INTEGRATED RESOURCE PLANNING FOR GAS UTILITIES²⁰
- 6.14 DEVELOP SUPPORTING GOVERNMENT POLICIES FOR RENEWABLE ENERGY
- 6.15 STIMULATE RENEWABLE ENERGY MARKETS²¹
- 6.16 DEVELOP RENEWABLE ENERGY INFRASTRUCTURE
- 6.18 MORE R&D TO ACCELERATE DEVELOPMENT OF RENEWABLE ENERGY TECHNOLOGIES²²
- 7.1 REDUCE EMISSIONS FROM WASTE LANDFILLS
- 7.2 REDUCE METHANE EMISSIONS FROM COAL MINES
- 7.3 CONTROL EMISSIONS OF HFCs
- 7.4 REDUCE EMISSIONS FROM ALUMINUM SMELTERS
- 7.5 REDUCE EMISSIONS FROM ADIPIC ACID PLANT
- 7.8 SUBSTITUTE WOOD FOR STEEL & CONCRETE IN BUILDINGS

AGRICULTURE

NOTE: These measures require further analysis on science, cost and baseline. This scenario for analysis assumes no CO2 reductions or costs until these data are collected.

- 7.9 REDUCTION IN SUMMER FALLOW ACREAGE
- 7.10 SOIL TILLAGE REDUCTION & ELIMINATION (NO-TILL SEEDING)
- 7.11 INCREASED PERENNIAL FORAGE CROP PRODUCTION
- 7.12 IMPROVED CROP YIELDS
- 7.13 REDUCTION IN METHANE EMISSIONS FROM RUMINANT FARM

subsumes measures 6.5 (increased cogen), 6.17 and 2.1 (district energy and encourage renewables @ utilities).

²⁰ Assume closer to 4% energy efficiency savings (see detail MEMO), not 1%; assume in all provinces where gas is used, not just 2; model out to 2005 and 2010, not just 2000; assume no net cost to governments or utilities or customers. Also assume some fuel switching is induced as part of least-cost plan.

²¹ Assume that by 2000 CANMET allocates 25% of current R&D funding to commercialization and demonstration of renewable energy.

²² Assume by 1998 50 per cent of all PERD funding (\$86.3 million / 50% = \$43.2 million) is allocated to research and development of renewable energy options, including fuel cells.

ANIMALS

- 7.14 REDUCTION IN EMISSIONS OF METHANE AND CARBON DIOXIDE FROM LIVESTOCK MANURE
- 7.15 REDUCTION IN EMISSIONS OF GHG ASSOCIATED WITH PRODUCTION OF MINERAL NITROGEN FERTILIZERS
- 7.16 REDUCTION IN FOSSIL FUEL USAGE FOR FARM OPERATIONS
- 7.17 EXPANDED PRODUCTION AND USAGE OF FUEL ETHANOL

ADAPTATION

- 1.1 DEVELOP A PUBLIC INFORMATION PROGRAM ON ADAPTATION
- 1.2 CONSIDER ATMOSPHERIC CHANGE IN ENV'L ASSESSMENT PROCESSES
- 1.3 CONSIDER ATMOSPHERIC CHANGE IN THE DEVELOPMENT OF NEW TECHNOLOGY
- 1.4 CONSIDER ATMOSPHERIC CHANGE IN THE DEVELOPMENT OF MAJOR INFRASTRUCTURE PROJECTS AND THE CONSTRUCTION INDUSTRY
- 2.1 AGRICULTURAL SECTOR ADAPTATION MEASURES
- 2.2 WATER RESOURCES ADAPTATION MEASURES
- 2.3 FORESTRY SECTOR ADAPTATION MEASURES
- 2.4 HAZARD AND COASTAL ZONE MGMT SECTOR ADAPTATION MEASURES
- 2.5 URBAN INFRASTRUCTURE AND CONSTRUCTION INDUSTRY ADAPTATION MEASURES

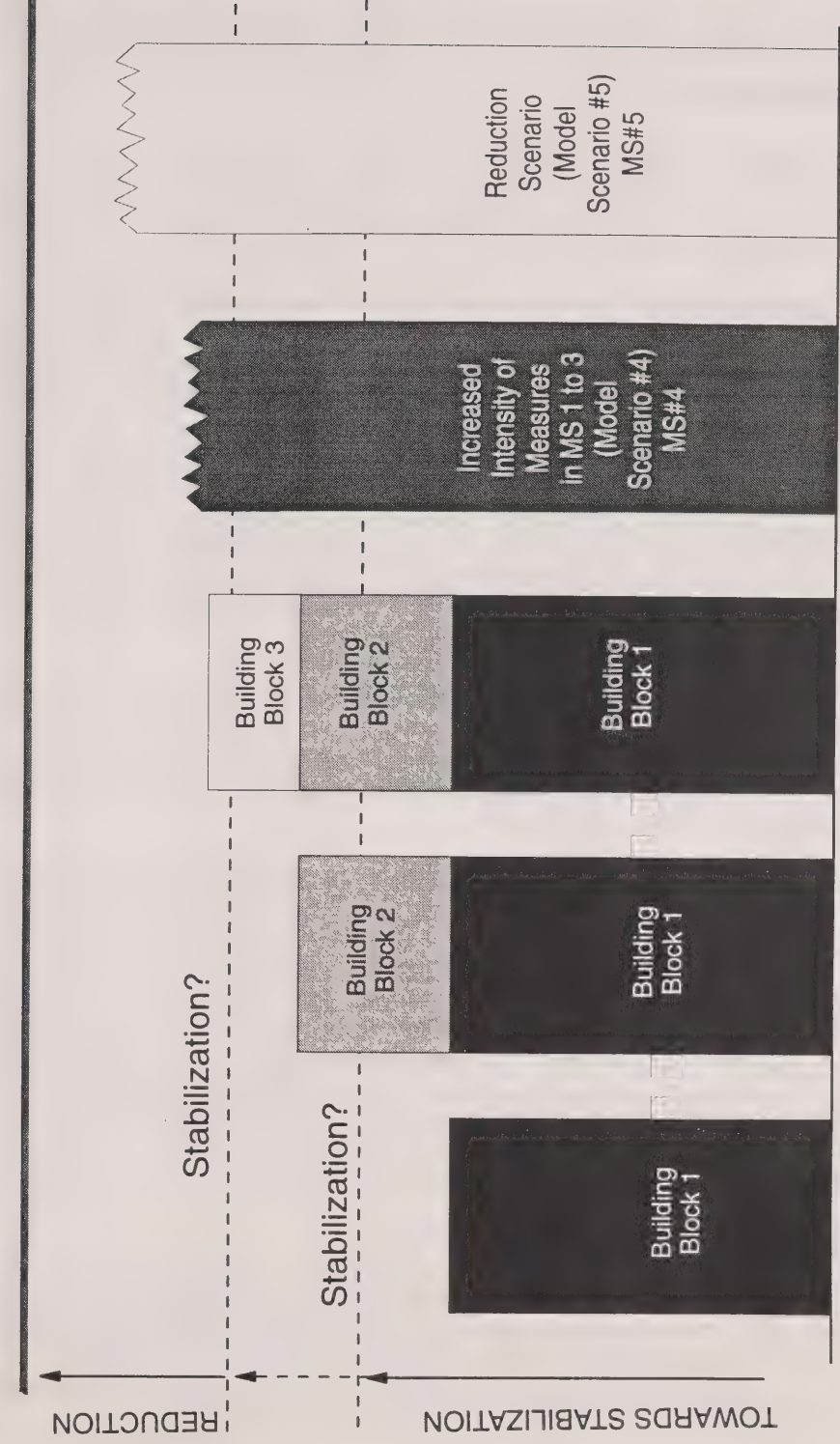
Section of measures/program for process continuation to be added. Studies, further multi-stakeholder efforts, monitoring and reporting on progress, public oversight body, etc.

The foregoing are the five modelling scenarios. Please see summary diagram on the next page.

LIST OF MEASURES NOT IN THE PRECEDING SCENARIOS

- 5.3 APPLY A GAS GUZZLER TAX
- 5.11 IMPLEMENT A VEHICLE EMISSIONS LABELLING PROGRAM
- 6.4 EXTEND DEMAND SIDE MANAGEMENT (DSM) PROGRAM
- 7.6 INVESTIGATE OPPORTUNITIES TO SEQUESTER AND UTILIZE CARBON DIOXIDE

TO FORM THE BASIS OF OPTIONS FOR GHG STABILIZATION and REDUCTION



OTHER ACTIONS TO ADDRESS CLIMATE CHANGE

ADAPTATION

In the context of climate change, adaptation refers to the actions required to achieve sustainable adjustments to future climatic environments. This goal is a vital component of the National Action Program and forms part of Canada's international obligation under the Framework Convention on Climate Change.

Successful adaptation to climate, both present and future, provides net economic benefits to all Canadians. It is estimated that we currently spend approximately \$9B or 2% of the GDP adapting to the present climate. While it is true that the Canadian economy functions well under current climate conditions, there are cases where maladaptation or increasing vulnerability need to be addressed. Such efforts can strengthen economic efficiency and enhance competitiveness. Furthermore, there is growing evidence internationally that climate-related hazard losses from such events as drought, severe storms and tornadoes are increasing at a more rapid rate than are losses from other hazards such as earthquakes (IDNDR Secretariat, 1994). Future climate change, and the associated expected increases in the number and magnitude of extreme events presents Canadians with the need to choose actions, change behaviour and make decisions which will provide net benefits for Canadians. Anticipatory adaptation can yield immediate benefits and reduce longer term vulnerability.

Successful adaptation does not replace the necessity to reduce greenhouse gas emissions, rather it forms part of a comprehensive approach which will increase the range of options available and make an optimal strategy for responding to climate change more likely. Such a comprehensive approach is an essential requirement for the development of an optimal and sustainable climate response strategy.

Responsibility for adaptive decisions is widely shared. It involves all levels of government, the private sector, communities and households. The role of government is to enable people to make sound adaptive decisions. The National Action Programme on Climate Change (NAPCC) supports an adaptation program that will enhance Canada's ability to adapt by means of greater public involvement, the incorporation of climate change and variability into environmental decision making, economic policies and financial practices. Opportunities also exist for the development of new technologies and adaptation research and development. These measures will also provide a good foundation for the future identification and assessment of strategic and tactical measures as Canadians may decide.

ADAPTATION MEASURES

FOUNDATION ADAPTATION MEASURES

- 1.1 DEVELOP A PUBLIC INFORMATION PROGRAM ON ADAPTATION
- 1.2 CONSIDER ATMOSPHERIC CHANGE IN ENVIRONMENTAL ASSESSMENT PROCESSES
- 1.3 CONSIDER ATMOSPHERIC CHANGE IN THE DEVELOPMENT OF NEW

TECHNOLOGY

- 1.4 CONSIDER ATMOSPHERIC CHANGE IN THE DEVELOPMENT OF MAJOR INFRASTRUCTURE PROJECTS AND THE CONSTRUCTION INDUSTRY

SECTORAL STRATEGIC AND TACTICAL ADAPTATION MEASURES

- 2.1 AGRICULTURAL SECTOR ADAPTATION MEASURES
 2.2 WATER RESOURCES ADAPTATION MEASURES
 2.3 FORESTRY SECTOR ADAPTATION MEASURES
 2.4 HAZARD AND COASTAL ZONE MANAGEMENT SECTOR ADAPTATION MEASURES
 2.5 URBAN INFRASTRUCTURE AND CONSTRUCTION INDUSTRY ADAPTATION MEASURES

IMPROVING SCIENTIFIC KNOWLEDGE

Decisions with respect to mitigating the risks of dangerous interference with the climate system and adapting to the consequences of such interference are impeded by only partial answers to a number of key policy questions, particularly the following:

- What are the natural processes that control the atmospheric concentrations of greenhouse gases and aerosols, and how do they respond to human interference and to climate change?
- What is the current state of global climate, how has it changed from past conditions, and what role have humans played in such changes to date, particularly during the last few decades?
- How is future climate likely to respond to the effects of continued human interference with the climate system?
- How sensitive are ecosystems and society to climate variability and change?
- How might more effective measures to adapt to climate change reduce the net costs of climate change?, and
- How effective are various policy measures aimed at reducing the risks of climate change through mitigation of human interference, what are their concurrent benefits in mitigating other environmental concerns, and what is the optimized mix of adaptation and mitigation measures?

Past and current research and systematic observation activities with Canada have contributed significantly to provisional, although very limited, answers to the above questions. Continuation of these activities will provide an important basis for gradually improving the usefulness of and confidence in these answers. However, Canada will need to adopt a number of additional measures to improve the efficiency of these efforts and to address major gaps in its domestic capacity to deal with Canadian concerns about climate change and effective Canadian

participation in related international research in a timely manner. These measures include a number of foundation or crosscutting actions, as well as more specific strategic and tactical initiatives, and are described in the appendix on science (Appendix F).

IMPACTS

The potential impacts of individual measures reducing greenhouse gas emissions are included in Appendix B along with some of the relevant costs and qualitative assessments regarding feasibility. Appendix C provides a roll up for each of these packages which enables an assessment of the contribution of the package towards achieving our emissions reductions goals and a broad picture of socio-economic effects.

IMPLEMENTATION

CABINET APPROVALS

The Report on Options will be presented to energy and environment ministers at their joint meeting in early November 1994, after consideration and input from interested stakeholders during October. Ministers will subsequently review the options presented to them for stabilizing greenhouse gas emissions and those which could reduce emissions in the post 2000 period. Federal, provincial and territorial ministers will need to discuss with their respective cabinet colleagues which options they are prepared to implement. Ministers will assess options according to environmental, economic, social and political considerations relevant to their jurisdiction and region. Canada has indicated its intention to table its National Action Program on Climate Change at the first meeting of the Conference of the Parties of the Framework Convention on Climate Change, in March 1995.

VOLUNTARY CHALLENGE COMMITMENTS

The private sector, governments at all levels and public sector institutions have an important role to play in mitigating greenhouse gas emissions in terms of their own actions and operations. An important element of this national action program is voluntary initiatives that business and other organizations are, or will be undertaking within the framework for action and recognition being developed through this program. An important element is the reporting and recording of actions and actual emission reductions achieved. Many companies in the private sector have recognized their responsibilities in this regard and have responded positively to a Challenge posed to the private sector by ministers to undertake initiatives to reduce emissions. The Voluntary Challenge is an important element of all Modelling Scenarios for mitigative measures.

The Voluntary Challenge and Registry Program is designed to address the following objectives:

- To encourage early voluntary action to reduce net greenhouse gas emissions.

- To inform Canadians of the opportunities to address climate change through voluntary cost effective action.
- To recognize voluntary action on the part of Canadians and provide a basis for future credits.
- To help assess aggregate voluntary Canadian actions and achievement in reducing net greenhouse gas emissions.
- To provide credibility for reliance on voluntary actions as a significant component of Canada's strategy.

Governments have also been taking voluntary actions to get their own "house in order" in addition to considering overall policy and program changes as recommended above.

In the end, responding to the climate change issue requires changes in the way all Canadians live and in the products they buy. Included in the recommendations to Ministers will be a number of information and education programs which are intended to begin this process of change. Please see Appendix E for further details.

ONGOING REVIEW, EVALUATION AND ASSESSMENT

The recommendations included in this report are the beginning of a process rather than the end. Climate change is a long term issue which can only be addressed by ongoing, concerted action. Moreover, our national action program needs to be dynamic in order to respond to world developments in understanding climate change and responding to it.

This report includes a first estimate of the impacts of the measures included herein. It is an estimate only and one which was prepared in a compressed timeframe. Moreover, some of the measures included in this report require further development and more detailed design before their impacts can be assessed with any degree of confidence. Others are inherently difficult to quantify and predict. The real impact of the options presented here will only be known after the measures have been implemented. Hence, an ongoing process of review and evaluation is critical to this draft program. The need for additional measures will need to be reassessed on a regular basis.

It is recommended that this assessment take place on two levels: the impact of the individual measures will need to be evaluated as they are implemented in order to build upon and improve their design. Secondly, the progress being achieved by the action program as a whole will need to be reviewed on a yearly basis in order to examine progress in meeting our climate change goals.

A particularly important element of this assessment will be the registry of voluntary climate change actions. It is very difficult to estimate in advance the extent and impact of voluntary actions. A registry is being designed as part of this program to record in a comprehensive way, actions being taken to limit greenhouse gas emissions and their impacts.

LIST OF APPENDICES

Appendix A:

DESCRIPTION OF MEASURES (WITH ADDENDUM)

Appendix B:

IMPACTS OF MEASURES FOR GHG EMISSION STABILIZATION BY 2000
IMPACTS OF MEASURES FOR GHG REDUCTION BY 2005

Appendix C:

IMPACTS OF PACKAGES OF MEASURES FOR GHG EMISSIONS STABILIZATION BY 2000
IMPACTS OF PACKAGES OF MEASURES FOR GHG REDUCTION BY 2005

NOTE:

- Data relevant to Appendices B and C is expected to be available in early October.
- The summary tables for Appendices B and C are notional at this time.
- Not all data may be available or even desirable.
- The attached tables are provided to stimulate discussion.
- Tables for reduction options and packages to 2005 are not included, but would follow the same format as for the stabilization tables.

Appendix D:

EMISSIONS OUTLOOK SUMMARY

Appendix E:

VOLUNTARY CHALLENGE

Appendix F:

SCIENCE (to follow)

Appendix G:

ADAPTATION (to follow)

APPENDIX A

to
Draft NAPCC
September 15, 1994

SUMMARY OF POTENTIAL MEASURES

Climate Change Task Group (CCTG) of the
National Air Issues Co-Ordinating Committee

Note: The addendum at the end of this appendix describes some modifications to measures used for modelling scenarios to assess the impacts of measures.

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- F3. DEVELOP A NATIONAL PROGRAM OF COMMUNICATION
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1. RESIDENTIAL SECTOR ENERGY CONSUMPTION MEASURES

THE NATIONAL NEW BUILDING INITIATIVE:
RESIDENTIAL SECTOR -- UMBRELLA PROGRAM

- 1.1 FACILITATE ADOPTION OF NATIONAL BUILDING
ENERGY EFFICIENCY CODE
- 1.2 PROMOTE ENERGY EFFICIENCY MORTGAGES FOR
RESIDENTIAL BUILDINGS
- 1.3 DEVELOP A NATIONAL HOME ENERGY RATING
SYSTEM (HERS) -- NEW HOMES
- 1.4 ESTABLISH A NATIONAL BUILDER TRAINING
PROGRAM: RESIDENTIAL BUILDINGS

THE NATIONAL RETROFIT INITIATIVE:
RESIDENTIAL SECTOR -- UMBRELLA PROGRAM

- 1.5 CREATE A NATIONAL LOW INCOME ENERGY
EFFICIENCY RETROFIT PROGRAM
- 1.6 ESTABLISH RETROFIT BUILDING STANDARDS
- 1.7 ENHANCE FINANCING MECHANISMS FOR HOME
ENERGY RETROFIT
- 1.8 DEVELOP A NATIONAL HOME ENERGY RATING
SYSTEM -- EXISTING HOMES
- 1.9 ESTABLISH A NATIONAL GREEN COMMUNITIES
PROGRAM

1.10 DEVELOP A RENOVATION/RETROFIT TRAINING PROGRAM

2. COMMERCIAL SECTOR ENERGY CONSUMPTION MEASURES

2.1 ACCELERATE THE APPLICATION OF DISTRICT ENERGY SYSTEMS

NATIONAL NEW BUILDINGS INITIATIVE:
COMMERCIAL SECTOR -- UMBRELLA PROGRAM

2.2 FACILITATE ADOPTION OF A NATIONAL ENERGY CODE FOR NEW COMMERCIAL BUILDINGS

2.3 PROMOTE ENERGY EFFICIENCY MORTGAGES: COMMERCIAL BUILDINGS

2.4 ESTABLISH A NATIONAL BUILDER TRAINING PROGRAM: NEW COMMERCIAL BUILDINGS

NATIONAL RETROFIT INITIATIVE: COMMERCIAL SECTOR -- UMBRELLA PROGRAM

2.5 ESTABLISH RETROFIT STANDARDS FOR COMMERCIAL BUILDINGS

2.6 IMPROVE FINANCING MECHANISMS FOR RETROFITTING COMMERCIAL BUILDINGS

2.7 ESTABLISH A NATIONAL BUILDER TRAINING PROGRAM: COMMERCIAL BUILDING RETROFITS

2.8 EXPAND THE FEDERAL BUILDINGS INITIATIVE (FBI)

2.9 EXPAND THE ENERGY INNOVATORS INITIATIVE

3. INDUSTRIAL SECTOR ENERGY CONSUMPTION MEASURES

3.1 ESTABLISH INDUSTRIAL EFFICIENCY INDICATORS

3.2 PROMOTE BENCHMARKING/BEST PRACTICES

3.3 IMPLEMENT AN INDUSTRIAL ENERGY INNOVATORS PROGRAM

3.4 COORDINATE AND PROMOTE AN ELECTRIC DRIVEPOWER CHALLENGE

3.5 ESTABLISH BOILER AND KILN EFFICIENCY STANDARDS

3.6 PROVIDE A TAX INCENTIVE FOR ENERGY EFFICIENT INDUSTRIAL PROCESS INVESTMENTS

4. APPLIANCE AND EQUIPMENT SECTOR PROGRAM

- 4.1 STANDARDS FOR APPLIANCES AND EQUIPMENT
- 4.2 LABELLING FOR APPLIANCES AND EQUIPMENT
- 4.3 IMPLEMENT A GOLDEN CARROT PROGRAM

5. TRANSPORTATION SECTOR ENERGY CONSUMPTION MEASURES

- 5.1 NATIONAL GREEN TRANSPORTATION STRATEGY

5-I VEHICLE EFFICIENCY MEASURES

- 5.2 ADOPT A NATIONAL INSPECTION AND MAINTENANCE PROGRAM WITHIN URBAN AREAS
- 5.3 APPLY A GAS GUZZLER TAX
- 5.4 INSTITUTE A NATIONAL FEEBATE SCHEME
- 5.5 COORDINATE AN ACCELERATED RETIREMENT (VEHICLE SCRAPPAGE) PROGRAM
- 5.6 APPLY A CANADIAN FUEL EFFICIENCY PREMIUM
- 5.7 INSTITUTE A FLEET PROCUREMENT AND MANAGEMENT PROGRAM
- 5.8 IMPROVE FUEL EFFICIENCY STANDARDS
- 5.9 INCREASE MOTOR FUEL TAXES AND PRICES
- 5.10 PROVIDE INCENTIVES FOR ALTERNATIVE TRANSPORTATION FUELS
- 5.11 IMPLEMENT A VEHICLE EMISSIONS LABELLING PROGRAM
- 5.12 IMPLEMENT R&D PROGRAMS FOR ADVANCED VEHICLE TECHNOLOGIES

5-II URBAN TRANSPORT MEASURES

- 5.13 PROMOTE INCREASED DENSITY IN URBAN AREAS
- 5.14 ENCOURAGE TELECOMMUTING AND ALTERNATIVE WORK STRATEGIES
- 5.15 IMPROVE CYCLING AND WALKING ENVIRONMENT
- 5.16 INCREASE TRANSIT RIDERSHIP
- 5.17 PROMOTE RIDESHARING
- 5.18 PROMOTE FULL-COST ROAD PRICING
- 5.19 PROMOTE FULL COST PARKING AND PARKING MANAGEMENT

5-III INTERCITY TRANSPORTATION MEASURES

- 5.20 DEVELOP HIGH SPEED RAIL SYSTEMS FOR HIGH DENSITY CORRIDORS
- 5.21 ENHANCE PASSENGER AND FREIGHT SERVICE COMPETITIVENESS
- 5.22a ENFORCE HIGHWAY SPEEDS
- 5.22b REDUCE HIGHWAY SPEEDS

6. ENERGY SUPPLY AND PRODUCTION SECTOR MEASURES

6-I ELECTRICITY SUPPLY AND DEMAND MEASURES

- 6.1 ELECTRIC UTILITY CLIMATE CHANGE CHALLENGE PROGRAM
- 6.2 INTEGRATED RESOURCE PLANNING (IRP)
- 6.3 SUPPLY SIDE EFFICIENCY IMPROVEMENTS
- 6.4 EXTEND DEMAND SIDE MANAGEMENT (DSM) PROGRAM
- 6.5 ELECTRICITY AND HEAT COGENERATION OPPORTUNITIES
- 6.6 INVESTIGATE GENERATION FUEL SWITCHING
- 6.7 EVALUATE INCREASED AVAILABILITY OF EXISTING HYDRO AND NUCLEAR GENERATION CAPACITY
- 6.8 INCREASED NON-UTILITY GENERATION (NUG)
- 6.9 ASSESS NEW LOW EMISSION GENERATION CAPACITY

6-II OIL AND GAS SUPPLY AND DEMAND MEASURES

- 6.10 CARBON DIOXIDE REDUCTION: UPSTREAM OIL AND GAS ENERGY EFFICIENCY IMPROVEMENT OPPORTUNITIES
- 6.11 METHANE REDUCTION: UPSTREAM OIL AND GAS INDUSTRY IMPROVEMENT OPPORTUNITIES
- 6.12 METHANE REDUCTION: DOWNSTREAM GAS DISTRIBUTION SECTOR OPPORTUNITIES
- 6.13 INTEGRATED RESOURCE PLANNING (IRP) FOR GAS DISTRIBUTION UTILITIES

6-III RENEWABLE ENERGY SUPPLY MEASURES

- 6.14 DEVELOP SUPPORTING GOVERNMENT POLICIES
- 6.15 STIMULATE RENEWABLE ENERGY MARKETS
- 6.16 DEVELOP RENEWABLE ENERGY INFRASTRUCTURE
- 6.17 ENCOURAGE UTILITY ADOPTION OF RENEWABLE ENERGY
- 6.18 REVITALIZE R&D TO ACCELERATE THE DEVELOPMENT OF CANADIAN RENEWABLE ENERGY TECHNOLOGIES

7. NON-ENERGY SECTOR MEASURES

7-I INDUSTRIAL SOURCES AND SINKS

- 7.1 REDUCE EMISSIONS FROM WASTE LANDFILLS
- 7.2 REDUCE METHANE EMISSIONS FROM COAL MINES
- 7.3 CONTROL EMISSIONS OF HFCs AND OTHER SUBSTITUTES FOR OZONE LAYER DEPLETION SUBSTANCES (ODS)
- 7.4 REDUCE EMISSIONS FROM ALUMINUM SMELTERS
- 7.5 REDUCE EMISSIONS FROM AN ADIPIC ACID PLANT
- 7.6 INVESTIGATE OPPORTUNITIES TO SEQUESTER AND UTILIZE CARBON DIOXIDE

7-II FORESTRY SOURCES AND SINKS

- 7.7 PROMOTE TREE PLANTING IN URBAN AND AGRICULTURAL SETTINGS
- 7.8 SUBSTITUTE WOOD PRODUCTS FOR STEEL AND CONCRETE IN THE COMMERCIAL BUILDING SECTOR

7-III AGRICULTURE

- 7.9 REDUCTION IN SUMMER FALLOW ACREAGE
- 7.10 SOIL TILLAGE REDUCTION AND ELIMINATION (no-till seeding)
- 7.11 INCREASED PERENNIAL FORAGE CROPO PRODUCTION
- 7.12 IMPROVED CROP YIELDS
- 7.13 REDUCTION IN METHANE EMISSIONS FROM RUMINANT FARM ANIMALS
- 7.14 REDUCTION IN EMISSIONS OF METHANE AND CARBON DIOXIDE FROM LIVESTOCK MANURE
- 7.15 REDUCTION IN EMISSIONS OF GHG GASES IN ASSOCIATION WITH THE PRODUCTION OF MINERAL NITROGEN FERTILIZERS
- 7.16 REDUCTION IN FOSSIL FUEL USAGE FOR FARM OPERATIONS
- 7.17 EXPANDED PRODUCTION AND USE OF FUEL ETHANOL

PART III: ADAPTATION MEASURES

ADAPTATION: TOWARDS A COMPREHENSIVE APPROACH

1. FOUNDATION ADAPTATION MEASURES

- 1.1 DEVELOP A PUBLIC INFORMATION PROGRAM ON ADAPTATION**
- 1.2 CONSIDER ATMOSPHERIC CHANGE IN ENVIRONMENTAL ASSESSMENT PROCESSES**
- 1.3 CONSIDER ATMOSPHERIC CHANGE IN THE DEVELOPMENT OF NEW TECHNOLOGY**
- 1.4 CONSIDER ATMOSPHERIC CHANGE IN THE DEVELOPMENT OF MAJOR INFRASTRUCTURE PROJECTS AND THE CONSTRUCTION INDUSTRY**

2. SECTORAL STRATEGIC AND TACTICAL ADAPTATION MEASURES

- 2.1 AGRICULTURAL SECTOR ADAPTATION MEASURES**
- 2.2 WATER RESOURCES SECTOR ADAPTATION MEASURES**
- 2.3 FORESTRY SECTOR ADAPTATION MEASURES**
- 2.4 HAZARD AND COASTAL ZONE MANAGEMENT SECTOR ADAPTATION MEASURES**
- 2.5 URBAN INFRASTRUCTURE AND CONSTRUCTION INDUSTRY ADAPTATION MEASURES**

PART I

FOUNDATION MEASURES

Background

The mitigation of Canadian greenhouse gas emissions is a complex task involving actions that touch almost every aspect of economic life. There are no straightforward solutions comparable, say, to cleaning up the effluent from a drainage pipe or a smoke stack. While we look to individual actions and measures in a particular sector, none of these is sufficient to meet the Canadian stabilization target established for 2000. Beyond 2000, to achieving reductions of the magnitude some are suggesting, would result in changes to the very framework of our society. A quick review of the proposed sectoral mitigation measures reveals the breadth of economic sectors touched: the energy production and supply sector; energy users in homes, businesses and industry; our transport systems; agriculture and forestry. A fundamental and strategic recognition, reflected in this report, is that a strictly sectoral approach to mitigation is insufficient. The issues are too broad, and the changes required ultimately are too profound to take a narrow sector-by-sector approach, even to achieve stabilization of emissions at 1990 levels. A cross-sectoral framework is required.

The foundation measures presented in this section cut across sectors and play an important role in motivating emission mitigation behaviour at all levels. Foundation measures can be classified in three generic categories: Voluntary, Economic or Regulatory.

F1. DEVELOP A VOLUNTARY CLIMATE CHALLENGE PROGRAM

Develop a program to encourage, facilitate and manage voluntary commitments by industry and governments. The program will encourage the development of plans and actions that reduce GHG emissions.

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Overview

The program is a mechanism for encouraging new voluntary actions by individual companies and governments. The program will incorporate voluntary measures proposed by industry, such as the electric utility and oil/gas sectors, and provide a framework for similar subsectoral programs.

The CCTG will develop the Voluntary Climate Challenge Program by November 1994 for inclusion in the National Action Program.

Description of Actions

The Challenge program should be developed with input from the federal, provincial, territorial and municipal governments. The Challenge should be extended to and developed with different sectors of the economy before it is announced to the general public.

Once it is developed the Challenge should start with an early public announcement in order to mobilize voluntary efforts to address climate change. It is important that this announcement include the purpose and scope of the Challenge and how it fits with existing voluntary programs and with the rest of the National Action Program. The announcement should indicate that program design include various elements, such as guiding principles and a Voluntary Registry. (See Measure F2.)

The program should include the following elements:

- Proactive solicitation and engagement of potential private sector and government participants;
- Declaration of intent to accept the challenge and participate through a letter of intent filed with the program secretariat, by participants;
- Provision of support to investigate and develop specific plans for reducing GHG gases by support staff in the National Climate Change Program;
- Negotiation and signing of a memorandum of understanding (or agreement) between the CCME (for Federal and Provincial governments) and the participants ... memorandums would include specific targets and schedules;
- Removal of institutional barriers to implementing voluntary actions, where appropriate;
- Preparation of action plans with details on how the reduction targets will be achieved;

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- Registration of each plan and associated GHG reduction commitments in the voluntary actions registry;
- Annual reporting on progress towards achieving reductions by participants;
- A mechanism to evaluate and verify that reductions actually occurred either annually or permanently;
- Pre-determined evaluation/assessment date at which point the success and results of the program will be assessed.

F2. ESTABLISH A NATIONAL REGISTRY OF VOLUNTARY MITIGATION ACTIONS

A registry will be established to record voluntary actions to reduce net emissions of greenhouse gases under the auspices of a Climate Challenge program. The measure will be designed to encourage action and provide a mechanism to track and evaluate actions.

Overview

Foundation measure F1 involves encouraging voluntary actions to reduce GHG emissions. A registry for these voluntary actions would operate as one component of a "Climate Challenge" program. It would provide the basis for recognizing programs, measuring achievements and accumulating data on the overall contribution of voluntary actions to reduce net emissions.

A decision will be required on what actions should be recorded in the registry. Should the registry be limited to reductions of greenhouse gas emissions or should other climate change activities such as sinks, adaptation work or improving scientific knowledge also be eligible for inclusion?

Description of Actions

- Design a registry for voluntary actions taken by Canadian governments (federal, provincial, territorial, municipal) organizations, and businesses to reduce net greenhouse gas emissions.

MEASURES TO REDUCE GREENHOUSE GASES

- Reporting requirements should include:
 - Registration of individual emission reduction plans;
 - Definition of eligible actions;
 - Registration of MOU's with private participants and governments;
 - Definition of reporting entities;
 - Definition of baselines, reference lines and estimated emissions reductions;
 - Outlining of tracking and evaluating methods;
- The Registry must provide:
 - Clear rules for the treatment of data;
 - Accessibility of data to all Canadian governments;
 - Assessment of data quality;
 - Evaluation of success of specific plans;
 - Evaluation of overall success of voluntary challenge program.
- Maintain and update the registry and prepare progress reports.
- Clearly define the roles of federal, provincial, territorial and municipal governments in the design and operation of the registry.

F3. DEVELOP A NATIONAL PROGRAM OF COMMUNICATION AND MOTIVATION

Environment Canada and Natural Resources Canada in cooperation with non-governmental organizations will develop a comprehensive and action-oriented public education program for Canadians on climate change (and other air issues). This Report (The Catalogue of Measures) will be used as a reference point on actions needed by Canadians to reach national climate change goals and objectives for other air issues.

Overview

In the past few years the communication of intended government policy either nationally or provincially through broad public awareness campaigns has been practised. The intent of such communications programs has been to support voluntary compliance with government policy by providing balanced information on a subject. Examples of such programs include energy conservation and environmental stewardship.

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Although Canadians have become more aware of problems related to air issues such as climate change, smog and ozone depletion, they do not necessarily understand the relationship of these issues to one another. Messages on climate change must be integrated with environmental motivation messages on other air issues so that individuals are made aware that their actions in one area may affect or improve conditions in another.

The following documents have been produced within Environment Canada to attempt to provide Canadians with useful information about climate change: "Did you know we live in a Greenhouse?" (1993), and "A Matter of Degrees: A Primer on Global Warming" (1993). Similar documents which promote an understanding of the climate change issue have been produced by several provincial governments, environmental groups and industrial stakeholders.

The purpose of a public education campaign on climate change and other air issues would be to create meaningful behaviour change over the longer term. Individual Canadians will be encouraged to take actions in their everyday lives that will contribute to our national objectives, such as those under the climate change action program.

Another important objective is to give public recognition to industry and others that take up the voluntary challenge. The recognition will serve as additional payback, possibly leading to further voluntary action by industry. It could also motivate changed behaviour in other stakeholders.

Description of Actions

An action-oriented public education campaign on climate change (and other air issues) should be developed for Canadians. This program will be based on current market research to establish a clear picture of target audiences and the barriers to action that currently exist. Input from stakeholders will provide valuable information in the development of the initiative. The Measures Report will be used as a reference point on actions needed by Canadians to meet national objectives on climate change and other air issues.

The full scope of the public education program will be determined by the availability of resources. A comprehensive program with associated costs will be developed. It will involve partnerships between Environment Canada, Natural Resources Canada, other government departments, other levels of government, stakeholders and sponsors, in both the development and delivery phases of the program. In particular, direct input will be sought from provincial governments, industry and consumer groups.

MEASURES TO REDUCE GREENHOUSE GASES

This public education initiative would include targets other than individual Canadians for behaviour change if appropriate. Small and medium-sized business might also be an important target audience.

Throughout the development of the National Action Program, and as milestones are reached, information will be provided to media and to interested Canadians regarding progress on the plan. An informed debate on the implications of the proposed measures for the National Action Program will be the first step in informed action by Canadian individuals or organizations.

F4. ESTABLISH A PILOT JOINT IMPLEMENTATION (JI) INITIATIVE

The following is presented as a marker in this Report for the rapid developments around the issues of Joint Implementation. It is presented as a work plan to be carried out under the leadership of Environment Canada over the coming months. It provides background on the issues and process surrounding JI.

Overview

Once fully developed, JI will allow a single country or corporate entity to invest in greenhouse gas emission reductions in another country in exchange for emission reduction credits against its own commitments. Development of JI should involve all stakeholders, including industry and environmental groups. Industry is generally supportive of this measure as it allows members flexibility in designing cost-effective response options to GHG reductions. Environmental groups oppose any use of JI until Canada has reduced its own emissions by 20%. They also oppose any JI involving carbon sequestration.

At the April 25-26, 1994 CCTG meeting, it was decided that Environment Canada would lead the development of analytical work on a Canadian Pilot Joint Implementation Initiative. It will draw on the Informal Group (Environment Canada, Natural Resources Canada, Foreign Affairs and International Trade Canada, TransAlta Utilities, Pembina Institute) that prepared materials for the April 23 JI workshop.

Issues to be addressed

1) Domestic Joint Implementation Efforts

How to proceed with the development of a Canadian Pilot Joint Implementation Initiative as part of the National Action Program on Climate Change.

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2) International Joint Implementation Negotiations

How to provide input into the Canadian position on JI for the 10th Climate Change Convention negotiating session (INC 10) - August 22 to September 2, 1994.

Recommended Short Term Approaches

1) Domestic Efforts

It is recommended that the CCTG task itself and the other stakeholders from the April 23 JI workshop (coordinated by Environment Canada and Natural Resources Canada) to develop this measure as follows:

- **June to mid-July 1994:** The JI Informal Group, which worked on the documentation for the April 23 workshop, would work on drafting the elements of a Canadian Pilot Joint Implementation Initiative. In doing so, the Group would take note of other thinking done in this area as outlined in the U.S. Joint Implementation Initiative documentation (issued late May or early June, 1994) and the INC Secretariat document on a JI pilot phase (to be issued at the end of June or early in July, 1994).
- **Mid-July 1994:** Environment Canada and Natural Resources Canada coordinate a one-day multistakeholder workshop (same participants as April 23 workshop) to agree on Canadian Pilot Joint Implementation Initiative as one component of Canada's National Action Program on Climate Change, based on the draft prepared by the Informal Group. Elements of the measure to be agreed upon include overarching statement, objectives, duration, eligibility, project criteria, institutional arrangements, incentives/recognition, impacts, and implementation timing. The agenda of this workshop would also include a briefing on the international situation, based on the INC Secretariat document prepared to guide the debate at INC 10.
- **End-July 1994:** The Informal Group should incorporate the results of the mid-July workshop into a revised measure.
- **August 8-9:** The CCTG will review and approve the measure.
- **September 1994:** The Canadian Pilot Joint Implementation Initiative will be incorporated into the draft National Action Program on Climate Change.

MEASURES TO REDUCE GREENHOUSE GASES

2) International Efforts

As the multistakeholder body which provides input to the federal government on Canada's international JI positioning, the CCTG should agree to the following process (which reflects the timing of the release of the INC Secretariat document on a JI pilot phase):

- **Mid- to late-July 1994:** Foreign Affairs and International Trade Canada, Environment Canada, and Natural Resources Canada submit a document to the CCTG on initial federal government thinking on a Canadian JI position for INC 10. Attached to this document would be the INC Secretariat paper prepared to guide the debate at INC 10.
- **August 8-9 1994:** The CCTG will discuss this paper and attempt to achieve as much consensus as possible to be provided as input to the federal government representatives in attendance.
- **September:** Environment Canada, Foreign Affairs and Natural Resources Canada submit to the CCTG written and verbal debriefs on the results of the INC 10 debate on JI.

F5. REDIRECT OR REMOVE SUBSIDIES

The CCTG has begun a discussion of the role played by existing federal and provincial subsidies in the energy, transportation, agriculture and forestry sectors. There is strong interest by the group in exploring opportunities for reducing, redirecting or removing subsidies which encourage greenhouse gas emitting activities. However, the CCTG recognizes the complexity of the subsidies issue, and is concerned that subsidies must be reviewed in terms of their environmental, economic and social benefits and costs before any recommendations on subsidy reduction, removal or redirection can be made.

The CCTG has decided that a "scoping study" is needed to determine how the subsidies issue can be best assessed from a climate change perspective. The purpose of the scoping study is to prepare an initial list of federal and provincial energy, transportation, agriculture and forestry subsidies and to develop a methodology to assess the impact of these subsidies on GHG emissions.

This scoping study is viewed as a first step in the development of a measure which could be included in the National Action Program. Using the framework developed through the scoping study, further work will be undertaken to provide recommendations on which subsidies could be practically reduced, removed or re-directed for the greatest economic and environmental benefit with the least public or stakeholder resistance.

F6. ASSESS A HARMONIZED CONTINENTAL CARBON CHARGE AMONG THE NAFTA COUNTRIES

Initiate a multistakeholder process to examine the potential for a harmonized continental carbon dioxide emissions charge in Canada, the U.S. and Mexico. The process will involve negotiations with the two countries, and an iterative process of design, assessment and analysis to address the major concerns of stakeholders.

Overview

As the largest volume greenhouse gas, carbon dioxide is emitted at almost every stage of industrial activity. Regulation of the diversity of emissions would be difficult, given the diversity of sources.

However setting a specific charge for carbon emissions would permit individual actors to factor the cost impact of the emissions into their individual decisions.

The charge should be generally applicable, not focussed on one specific industrial sector or source of carbon dioxide emissions.

However, like all economic instruments, if a charge is levied in one jurisdiction prior to similar charges being developed by its trading partners, the impact on its economy, and on carbon-intensive sectors, in particular, could be devastating.

Therefore, this measure must be developed through careful stakeholder analysis to be clear about the internal distributional effects of a possible charge. Even more importantly, the charge must be coordinated and harmonized with developments by Canada's major trading partners. [Uncoordinated implementation would risk transfer of industrial activity to other countries with both negative economic results and possible net increase in emissions as "dirtier" fuels transported over a greater distance are used to manufacture the substitute for Canadian commodities.

Description of Actions

It will be necessary to define the various types of charges possible, and to design the most comprehensive approach possible.

In parallel with clearer definition of the options, a diplomatic initiative would attempt to coordinate the process with U.S. and Mexican Governments to determine interest in a harmonized approach on a continental basis and with other trading partners. Such an initiative

could well be assigned to a mechanism such as the North American Commission on the Environment (NACE) which resulted from the NAFTA accord.

It will be important to assess the impact of the charge on North America, and individual assessments of the impacts on each country and region.

This analysis will be taken with extensive stakeholder consultation in Canada where many interests have been identified through groups such as the Economic Instruments Collaborative, and presumably in the other jurisdictions.

F7. DESIGN A TRADEABLE PERMITS SYSTEM

A greenhouse gas tradeable permit system should be evaluated with respect to its net emission reduction potential, its economic impacts and potential for cross-sectoral participation.

Overview

This is an economic instrument which requires initial regulation. Subsequent trade allows the market to determine cost-effective solutions to reducing GHG emissions. A tradeable permits program would set a ceiling/cap on total allowable emissions of a pollutant. The total allowable emissions are then allocated among the sources of the pollutant. Sources are issued permits, which can be traded, authorizing them to emit a specified amount of the pollutant.

A tradeable permits program could be a cost-effective way to achieve a set environmental objective. It may be feasible to implement a tradeable permits program in Canada, particularly for large sources of carbon dioxide emissions, to help reduce emissions.

Description of Actions

Further research is recommended to design a tradeable permits program for Canada, and to estimate the corresponding impacts (both to industry and government) of this measure. A possible pilot project with major stationary emitters such as electric utilities and other industrial groups will be investigated. A design and analysis team will be developed under federal coordination with the provinces, the utilities and non-rate based industry. Consideration will be given to harmonizing an emissions permit trading system with Canada's major trading partners.

F8. CREATE A MOTIVATION FUND TO SUPPORT MEASURES

A fund would be established to support projects to reduce greenhouse gas emissions, on a low-bid basis.

Overview

The intent of this measure is to buy the necessary emission reductions at the lowest cost. A fund would be established to support projects to reduce emissions. Any organization or individual could submit bids to have the fund cover a portion of the cost of a project to reduce emissions. Projects would be screened on basic criteria and selected on the basis of lowest cost to the fund per unit reduction.

Description of Actions

Funding will be sought from a number of sources, including the federal and provincial governments, utilities (as a form of demand-side management), and possibly industry (as a form of offset for emissions). Existing funding could be redirected to the motivation fund. Traditional venture capital financing sources will also be approached, thereby minimizing government input requirements.

Decisions on winning bids will be made by screening bids based on the established criteria, assessing the likelihood of results, and ranking the bids based on the cost per unit of emissions reduction. Bids would then be awarded in sequence by rank to the extent of the funding available.

Criteria and design will be established with input from stakeholders. Administration of the fund and selection of bids could be carried out by government or an independent panel.

PART II

SECTORAL MITIGATION MEASURES

A sectoral breakdown of measures has been followed for a variety of reasons. First, inventories of greenhouse gases have been developed on this basis. Identifying measures by sector facilitates the analysis of measure impacts and eventually the monitoring of progress within a sector toward the meeting of reduction targets. Second, stakeholders clearly relate to measures when they have been identified by sector. Measure definition can be simpler when stakeholders identify their interests and measure implications. When negotiating equity and burden sharing the debate is further informed when sectoral interests are defined. When required sectors can be further subdivided to more clearly define stakeholder interests. For example Energy Supply and Production has been categorized as Electricity, Gas/Oil and Renewable Energy.

Six sectoral groupings have been chosen:

1. Residential Energy Consumption
2. Commercial Energy Consumption
3. Industrial Energy Consumption
4. Appliances
5. Transportation Energy Consumption
6. Energy Supply and Production
7. Non-Energy Sources.

1. RESIDENTIAL SECTOR ENERGY CONSUMPTION MEASURES

THE NATIONAL NEW BUILDING INITIATIVE: RESIDENTIAL SECTOR – UMBRELLA PROGRAM

The National New Buildings Initiative (NNBI) will be an "umbrella" program under which several, carefully targeted measures will be implemented. The lead will be taken by a variety of institutional stakeholders. The NNBI is conceived as an integrated program that combines and optimizes regulatory, financial, and information based initiatives to help reduce energy use in new residential buildings.

Measures

The residential NNBI will be comprised of the following specific measures.

- 1.1 Facilitate Adoption of National Building Energy Efficiency Code
- 1.2 Promote Energy Efficiency Mortgages for Residential Buildings
- 1.3 Develop a National Home Energy Rating System (HERS) -- New Homes
- 1.4 Establish a National Builder Training Program: Residential Buildings

1.1 FACILITATE ADOPTION OF NATIONAL BUILDING ENERGY EFFICIENCY CODE

Natural Resources Canada will facilitate the accelerated adoption by provinces, territories, and other jurisdictions of the "National Energy Code for Houses" (NECH) and levels of construction practice that exceed the Code. For provinces and territories, the Code will be promoted for mandatory adoption. For other jurisdictions, advanced levels of practice will be encouraged on a voluntary basis.

- Mandatory
- Voluntary
- Technology Transfer.

RESIDENTIAL SECTOR REPORT

Overview

This measure refers to a combination of legislative, informational, and technical activities aimed at ensuring that the appropriate jurisdictions adopt the "National Energy Code for Houses" (NECH). It is scheduled to be included in the new National Building Code due to be released by the federal government in 1995. The Code contains a set of mandatory requirements as well as both prescriptive and performance standards to thermal performance levels appropriate to specific geographical areas.

The NECH was developed through a consultative process involving volunteer experts from institutions, government, and the private sector. The provinces have been a major player in the NECH development and, therefore, the aim is that with the appropriate facilitation, the provinces will adopt the NECH as a mandatory requirement soon after 1995.

The NECH is perceived as a minimum requirement and measures to enhance the performance requirements beyond the Code will be considered under the auspices of this measure (Natural Resources Canada has estimated that, compared to the 1983 Measures for Energy Conservation in Buildings, the 1995 NECH will be 11% to 20% more efficient). The Natural Resources Canada "Advanced House" program, as well as other initiatives at both the federal and provincial levels, have established a sound technical basis for high performance construction practices.

Description of Actions

Two parallel action "tracks" are proposed:

- The development and application of the necessary tools with which the provinces and other jurisdictions adopt the NECH as a mandatory requirement to be integrated into the building codes. Since the provinces already have participated in the Code development, they are essentially on track for adoption sometime after 1995. Under the auspices of the NNBI, technical, information, and training tools will be developed to facilitate and, hopefully, accelerate the Code adoption.
- Working towards the voluntary adoption by appropriate jurisdiction of a more stringent code i.e., best practice levels exceeding the NECH. Best practice can be considered to include solar applications. The Code would require higher levels of thermal performance in new housing. It is proposed that this can be facilitated at the community or municipal level.

Both of these tracks could be supported by additional technology transfer activities such as:

- Research and development into reducing the cost of super-efficient buildings;

MEASURES TO REDUCE GREENHOUSE GASES

- An outreach and training program for the Canadian building industry to explain the need for significant changes in building practices to reduce energy consumption.

1.2 PROMOTE ENERGY EFFICIENCY MORTGAGES FOR RESIDENTIAL BUILDINGS

Natural Resources Canada and other federal departments, supported by lending institutions, will facilitate the development of financing mechanisms to leverage investment in energy efficient new residential construction.

- Economic instrument
- Consumer awareness.

Overview

This measure refers to the development and implementation of a financing mechanism that would meet the cash flow requirements of customers seeking to invest in energy efficient new residential construction. Mortgage based financing remains the dominant form of financing home purchases and, therefore, the financing mechanism will focus on the provision of preferential mortgage interest and term conditions associated with either the full cost of the energy efficient new building, or that portion of the capital expenditure related to the advanced energy efficiency features.

Preferential terms could include features such as: i) discounted interest rates, ii) more flexible repayment terms (e.g., longer terms); iii) favourable debt to income ratios, and iv) payment outlays geared to the projected or actual monthly operating cost savings anticipated from the improved performance of the dwelling. The financing mechanisms could possibly be targeted to both builders and homebuyers. In particular, tract builders might be encouraged to build high performance homes if the upfront incremental costs could be partially alleviated through the preferential mortgage terms.

The financing mechanism will be developed in partnership between the public and private sector institutions. The public sector will take the lead in the facilitation of the measure by, for example, providing guarantees for private financing. The private lending institutions will market and administer the financing mechanisms.

Description of Actions

- Conduct market research to determine homebuyer and builder financing concerns and needs.

- Consult with the private lending community to determine interest and concerns, in particular, the levels of risk these institutions are willing to consider.
- Develop tools with which prospective homes could be rated for energy performance.
- Develop a promotional campaign.

1.3 DEVELOP A NATIONAL HOME ENERGY RATING SYSTEM (HERS) -- NEW HOMES

Natural Resources Canada, in association with the provinces, utilities, lending institutions, and the real estate industry, will facilitate the development of a national home energy rating system. This will be pursued either as a voluntary or mandatory measure that can be adopted at various jurisdictional levels and delivered through various public and private entities.

- **Voluntary**
- **Mandatory**
- **Information Transfer.**

Overview

A Home Energy Rating System (HERS) is a representation of the energy efficiency of a residential dwelling, based either on a set of technical efficiency standards or on a technical tool that assesses the home's energy efficiency in comparison to other homes. This measure refers to the development and application of a national HERS, in conjunction with other initiatives aimed at the residential new construction and existing building markets.

A HERS is essentially a performance tool that can be used to foster a ratings/labelling program or to complement other measures such as Energy Efficiency mortgages. The applications of HERS generally fall into three categories:

- **Providing objective information to homeowners and buyers throughout the housing market;**
- **Supporting utility load shape and marketing goals in the new and existing housing markets;**
- **Influencing energy efficiency practices in new and existing homes.**

As a voluntary measure, a HERS could be adopted by the building and real estate community to help the sale of new homes. Government and utilities might use the HERS as an awareness tool under the auspices of existing or planned programs in the new housing sector. Through municipal by-laws, a mandatory HERS application would be required in order for a new house to be sold.

Description of Actions

As proposed, a HERS development could proceed under two tracks: mandatory and voluntary:

- **Mandatory:** This refers to the adoption by provinces and/or municipalities of mandatory ratings for all new homes. The rating could be linked to existing standards such as R-2000 or the national Energy Code for Houses. The rating could also allow for "points" on so-called green attributes. No new homes could be sold without a rating. (This could eventually be extended to existing homes.) The target audience would be the home builders.
- **Voluntary:** The rating program would be a voluntary option that could be used to show code compliance, R-2000 compliance, or other prescribed levels of energy performance. The target audience would be the real estate profession.

Specific actions that fall under both tracks include:

- Establish a consultative process designed to frame the focus and approach for a national HERS.
- Develop appropriate ratings tools with which dwelling energy performance can be easily assessed.
- Train and certify home raters.
- Develop an appropriate labelling approach.
- Develop a promotional initiative to complement the HERS.

1.4 ESTABLISH A NATIONAL BUILDER TRAINING PROGRAM: RESIDENTIAL BUILDINGS

Natural Resources Canada, in association with the provinces, builders and other trade allies, will develop a national program to train builders and related trades in the design and construction of high efficiency new homes.

- **Voluntary**
- **Information Transfer.**

RESIDENTIAL SECTOR REPORT

Overview

The federal government has directly or indirectly supported energy efficient new construction builder rating for several years, primarily under the auspices of the R-2000 program. Under this measure, the training support will be enhanced through a residential version of the Canadian Energy Management and Environmental training (CEMET) program.

This measure is linked to training initiatives for new construction in the commercial sector, and will help prepare builders for the next improvement to the NECH. Further elaboration is provided in the description of Measure 2.4.

THE NATIONAL RETROFIT INITIATIVE: RESIDENTIAL SECTOR – UMBRELLA PROGRAM

The National Retrofit Initiative (NRI) will be an umbrella program initiated by Natural Resources Canada under which targeted measures will be implemented to optimize energy efficiency opportunities and GHG reduction in the existing residential sector.

Specifically, the NRI comprises six measures:

- 1.5 Create a National Low Income Energy Efficient Retrofit Program
- 1.6 Establish Retrofit Building Standards
- 1.7 Enhance Financing Mechanisms for Home Energy Retrofit
- 1.8 Develop a National Home Energy Rating System -- Existing Homes
- 1.9 Establish a National Green Communities Program
- 1.10 Develop a Renovation/Retrofit Training Program

1.5 CREATE A NATIONAL LOW INCOME ENERGY EFFICIENCY RETROFIT PROGRAM

CMHC will enhance its Residential Rehabilitation Assistance Program (RRAP) to create a national low income retrofit program.

- **Mandatory requirements**
- **Financial incentives.**

Overview

This measure refers to the extension of CMHC'S Residential Rehabilitation Assistance Program (RRAP) to incorporate prescriptive energy efficiency measures. RRAP is a social housing program administered by the Canada Mortgage and Housing Corporation (CMHC). RRAP provides loans to low income households (a portion of which may be forgivable) to support essential repairs which will realize minimum health and safety standards in existing housing.

To be eligible for RRAP funding, the housing unit or structure must be substandard or require major repairs; or lack basic facilities in structural soundness, electrical system, plumbing, heating, fire safety; or be a crowded dwelling in rural areas. Neither energy nor water demand management figure in the assessment of eligibility. Upgrades are assessed on the basis of minimum cost.

RESIDENTIAL SECTOR REPORT

Under this measure, additional funding will be earmarked to expand the program to a "national low income energy efficiency program" offering financial support for comprehensive upgrades that embody energy efficiency. The Retrofit Options workshop held in Aylmer in November 1993 addressed the possibility of a national low income retrofit program.

There is the possibility of using an enhanced RRAP as a vehicle for moving to a mandatory energy standard for all CMHC-financed housing.

Description of Actions

- Develop guidelines to assess energy efficient needs and determine qualification for funding.
- Assess the energy efficiency needs in that portion of the existing housing stock that would meet the eligibility requirements of the program.
- Review funding requirements.
- Consult with the renovation and retrofit trades to assess the availability and capability of the required services.

1.6 ESTABLISH RETROFIT BUILDING STANDARDS

In cooperation with the provinces, territories, utilities, and other stakeholders, Natural Resources Canada will facilitate the adoption of energy codes which will stipulate that housing renovations meet prescribed energy performance requirements. For provinces and territories, adoption of the standards will be voluntary; upon adoption, conforming to the standards will be mandatory in that province or territory. For other jurisdictions, advanced levels of practice will be encouraged on a voluntary basis. The initiatives will encompass a combination of regulatory, informational, and technical components.

- **Mandatory**
- **Voluntary**
- **Technology Transfer.**

Overview

This measure will build upon the already existing process and experience associated with the development of the National Energy Code for Houses (NECH), to be included in the new National Building Code (scheduled to come into effect some time in 1995). The NECH was developed through a collaborative process which has secured a high degree of "buy-in" from the provinces, who have most of the jurisdictional authority for building standards.

MEASURES TO REDUCE GREENHOUSE GASES

As in the case of the NECH, the proposed retrofit standard could include a set of mandatory requirements and the option of pursuing either prescriptive or performance based paths of compliance. Provinces and municipalities could adopt the standard for code requirements pertaining to building renovations and retrofits. Under code requirements, the standard could be approved at the point of issuing building permits or as a condition of transferring ownership.

Adaptation of the NECH for housing renovation was discussed during the Retrofit Options Workshop, held in Aylmer, Quebec, in November 1993. There was some interest in the concept, especially in terms of possible linkages to other complementary measures such as new financing mechanisms and Home Energy Rating Systems.

Description of Actions

Two parallel action tracks are proposed:

- The development and application of the necessary tools with which provinces and other jurisdictions adopt a "consensus" code as a mandatory requirement into the existing building codes.
- Working towards the voluntary adoption of a more stringent code (i.e., a best practice level) into renovation and retrofit practices. This level could become mandatory under the auspices of municipal jurisdictions or could form the basis for demonstrations.

Specific actions would include:

- Undertake consultations to establish a distinction between a "consensus" minimum level and a best practice level of performance.
- Develop a lifecycle cost justified list of mandatory requirements.
- Develop a list of geographically specific prescriptive and performance requirements.
- Establish a collaborative process for consultation among the provinces and other key stakeholders.
- Explore and develop, if feasible, approaches with which the standards application could be integrated with other initiatives such as home energy rating systems and innovative financing schemes.

1.7 ENHANCE FINANCING MECHANISMS FOR HOME ENERGY RETROFIT

Natural Resources Canada will facilitate the development of financing mechanisms to leverage investment in energy efficiency retrofits of existing dwellings.

- Economic Instrument
- Consumer Awareness.

Overview

This measure refers to the development and application of financing mechanisms that would meet the cash flow requirements of customers seeking to invest in residential retrofits. The financing options will focus on the provision of preferential interest and term conditions associated either with the full cost of a renovation, or that portion of the renovation that encompasses retrofit features. The key will be to establish terms and conditions that enable customers to receive positive cash flows during the investment's amortization period.

This measure is similar in intent and scope to that of the residential new dwelling "Energy Efficiency Mortgage Measure". (See Measure 1.2.) However, there would be some important distinctions. First, the emphasis would likely be on loan packages rather than mortgages, although for large renovations, mortgage refinancings or second mortgages are possible financing mechanisms. Second, the initiative will be targeted towards the renovation rather than the construction industry.

As in the case of the Energy Efficiency Mortgages, the government's role may extend beyond facilitation to cover some of the risk held by lending institutions.

Description of Actions

Actions required to develop and implement the program would be similar to those required for the new housing Energy Efficiency Mortgages. (See Measure 1.2.) A possibly key element will be the investigation and development of a ratings tool with which the lending community will be able to assess energy performance. (See Measure 1.8.)

MEASURES TO REDUCE GREENHOUSE GASES

1.8 DEVELOP A NATIONAL HOME ENERGY RATING SYSTEM -- EXISTING HOMES

Natural Resources Canada, in association with the provinces, utilities, lending institutions, and the renovation/retrofit industry, will facilitate the development of a national home energy ratings system (HERS). This measure can be developed either on a mandatory or voluntary basis.

- Voluntary
- Mandatory
- Information Transfer.

Overview

This measure is largely similar to the HERS measure proposed for the residential new housing sector. They could possibly be developed jointly as a single measure. (See Measure 1.3.) The major distinctions for a HERS directed towards the existing housing sector are:

- The measure targets the existing dwellings.
- The ratings would likely be based on a common scale, i.e., a home's energy efficiency is rated in relation to others on a pre-determined scale.
- Key stakeholders would be different and would include renovation/retrofit contractors, lending institutions, and home inspectors.

1.9 ESTABLISH A NATIONAL GREEN COMMUNITIES PROGRAM

Natural Resources Canada, in association with the provinces and other stakeholders, will help finance and facilitate the national replication of the Ontario government residential component of the "Green Community" concept.

- Voluntary

Overview

This measure refers to the promotion and support for the replication nationally of the "green communities" concept. In the past few years, community based approaches to energy efficiency and water and waste management have emerged in communities in North America and Europe. Advocates of this approach believe that well-planned and managed initiatives, undertaken at the local level, will address many of the barriers to energy efficiency. By their nature, locally based

approaches can integrate well with other complementary retrofit market initiatives such as HERS, green audits, and new financing mechanisms. This measure would focus on technology transfer and facilitation actions to help replicate successful models of green communities on a national basis.

A Green Communities program could market a retrofit program to an entire neighbourhood at a time (including small commercial buildings) and do the initial audits. This information could then be passed onto professional trades people to do the necessary retrofits.

By splitting the marketing and auditing from the retrofitting, a Green Communities program can reduce the upfront costs of energy service companies and other trades people, allowing them to focus on the work they do best.

Description of Actions

Depending on the nature of the initiative, a range of national actions could be undertaken.

- Review and assess existing green community approaches to determine the aspects of the service best suited for replication.
- Establish a consultation and collaboration mechanism with the provinces and municipalities under which the federal government can discuss its roles as replicator as a complement to the roles to be pursued by other jurisdictions.
- Develop a green audit protocol and provide auditor training and certification.
- Establish a promotional program to support the measure, possibly with the use of home labelling.
- Fund research into reducing the costs of retrofit measures.

1.10 DEVELOP A RENOVATION/RETROFIT TRAINING PROGRAM

The federal government, in association with the provinces, contractors, and other trade allies, will develop a national program to train the renovation/retrofit industry in the application of energy efficiency retrofit techniques.

- Voluntary
- Training.

MEASURES TO REDUCE GREENHOUSE GASES

This measure is similar to the training program proposed for new buildings in the residential sector. (See Measure 1.4.)

Overview

The federal and provincial governments, as well as the utilities, have been providing training and related technology transfer services to the retrofit industry for several years. Under this measure, the training support will be enhanced through a residential version of the federal Energy Management and Environmental Training (CEMET) program.

During the national Retrofit Options Workshop, held in Aylmer, Quebec in November 1993, a consensus emerged among participants that the federal government should take the lead in the development of a coordinated training initiative for the retrofit sector. In particular, a linkage was drawn between training and certification. The Workshop recommended the following activities:

- Development and maintenance of a national database on available retrofit training courses and materials.
- Development of a current curriculum on energy retrofitting, based on a house-as-a system principles, to serve as the basis for courses targeted to all building trades.
- Delivery of technical "how-to" retrofit training for contractors, either for stand-alone or piggyback retrofits, with support materials such as advisory documents and videos on new and advanced technologies and retrofit methods.
- Development of a consensus on a nationally-recognized certification program for those completing training courses, and on training-related issues such as whether training could be mandatory or voluntary, how to motivate contractors and trades to attend, and how to fund course development.
- Development of a basic training package and/or advisory materials for do-it-yourselfers.

2. COMMERCIAL SECTOR ENERGY CONSUMPTION MEASURES

What is the Commercial Sector?

The commercial sector includes building segments that can be classified either as private commercial or public/quasi-public institutional buildings. The commercial sector includes high rise apartment buildings which are assumed to be buildings of three storeys or higher. Depending on the building type, the distinction between commercial and institutional sometimes becomes blurred. For example, office buildings can either be under private or public ownership or management.

2.1 ACCELERATE THE APPLICATION OF DISTRICT ENERGY SYSTEMS

Using financial instruments, the federal government will accelerate the application of district energy systems that facilitate the use of renewable energy and waste heat, or improve the overall efficiency of energy systems. The government will work with the provinces and municipalities to implement integrated municipal energy planning strategies. This measure applies to the commercial, residential and industrial sectors.

Overview

District energy systems distribute thermal energy, in the form of chilled water, hot water or steam, from a central plant or network of plants through underground pipes to individual buildings to provide space heating, air conditioning, domestic hot water and industrial process energy.

Recently, district energy systems have been gaining recognition in Canada and internationally for their potential to reduce the emission of greenhouse gases within communities. In particular, district heating systems based on the combined production of heat and power (or CHP) can take advantage of high energy conversion efficiencies of 80% and more. When CHP replaces the separate production of heat and electricity, the combustion of fossil fuel and the corresponding emission of products of combustion can be reduced by 35%.

Once established, a district heating system can also be used to recover and transport non-conventional sources of heat such as waste heat (process heat from industry) and renewable resources (such as solar heat and biomass which is CO₂ neutral over time) and reduce the combustion of traditional fossil fuels.

MEASURES TO REDUCE GREENHOUSE GASES

The district heating infrastructure also offers the potential economic recovery of methane gas from landfill sites for use in heating. The combustion of landfill gas converts methane to CO₂, a product with a lower global warming potential, and at the same time produces heat and reduces the need to burn other fuels. Current estimates are that methane from landfill sites makes up 5% of the total global release of methane.

District cooling has the potential to reduce electricity demands by generating cooling with higher efficiency central chillers. For areas where electricity is produced from fossil fuel fired condensing plants, district cooling also represents a means of reducing greenhouse gas emissions.

District energy systems are capital intensive, making financing and initial market penetration very difficult. District energy also faces a number of regulatory and institutional barriers. This measure would build upon existing initiatives aimed at addressing barriers to district energy system applications.

Description of Actions

- Where it is economically feasible, convert existing thermal electric power plants close to heating loads to combined heat and power (CHP or cogeneration) operation, to increase conversion efficiencies from about 35% to over 80% thus reducing CO₂ or fuel burned by over 30% where applied;
- Require that all new thermal electric power generation utilize CHP and that such generation is sized and located to facilitate this application (this is the law in Denmark and the effective policy in many European countries);
- Thermal electric power plants that have no possibility of CHP operation might be considered for shutdown unless they can be justified for peaking use if no heat loads can be developed in their vicinity;
- Where communities have access to biomass, encourage biomass based district energy projects -- the district heating system can achieve economies of scale to justify such projects which might otherwise be prohibitively expensive;
- Where industrial or municipal waste heat sources exist, utilize such sources for the displacement of fossil fuels for space heating; and
- Where appropriate, design central cooling projects, such as the Deep Lake Water Cooling Project in Toronto, which could reduce the electrical peak load by over 300 MW. This is both an efficiency and a renewable energy strategy.

COMMERCIAL SECTOR MEASURES

There are a variety of financial and institutional barriers to district energy system applications. Several options are being considered to address these barriers. They include:

- Creative financing mechanisms, such as:
 - o A revolving fund to support up to 75% of engineering costs which would be repayable upon capitalization of the project;
 - o A full or partial loan guarantee for construction of the project;
 - o Projects adopting renewable energy or high efficiency technologies (e.g., biomass, CHP, waste heat recovery etc.), should be given a capital and engineering cost rebate equal to the lesser of a maximum of 25% of eligible construction or \$2 million. The percentage will be calculated based on the use of renewable energy or reduction in CO₂ emissions.
- Joint inter-governmental cooperation to integrate district energy system development with other initiatives. Measures have been discussed with several provinces, particularly Ontario and Nova Scotia who are interested in a joint program. Program concepts were developed for and accepted by the Federal Provincial Infrastructure Program but only limited funds will be available due to other municipal priority projects (eg. water, sewer, roads, etc.).

Program delivery would have a federal management or technical/economic review core, but would be delivered through or in conjunction with provinces. Extensive discussions have already been held.

NATIONAL NEW BUILDINGS INITIATIVE: COMMERCIAL SECTOR – UMBRELLA PROGRAM

The National New Buildings Initiative (NNBI) will be an "umbrella" program facilitated by the federal government. Several distinct, but related measures can be considered for implementation.

2.2 FACILITATE ADOPTION OF A NATIONAL ENERGY CODE FOR NEW COMMERCIAL BUILDINGS

The federal government will facilitate the accelerated adoption of the National Energy Code for Buildings (NECB) and levels of construction that exceed the Code's performance. For provinces and territories, the Code will be promoted for mandatory adoption. For other jurisdictions, advanced levels of practice will be encouraged on a voluntary basis.

- **Mandatory**
- **Voluntary**
- **Technology Transfer.**

This measure is similar in many respects to the proposed New Building Code for residential dwellings. (See Measure 1.1.) The following discussion highlights aspects of the commercial program that are different from that of the residential measure.

Overview

This measure refers to a combination of legislative, informational, and technical activities aimed at ensuring that the appropriate jurisdictions adopt the NECB. The NECB has been developed at the federal level for inclusion in the National Building Code of Canada in 1995.

The NECB has been developed through a consultative process involving volunteer experts from institutions, government, and the private sector. The provinces have been a major player in the NECB development and, therefore, the aim is that with the appropriate facilitation, the provinces will adopt the NECB as a mandatory requirement sometime soon after 1995.

The Code is perceived as a minimum requirement and, therefore, measures to enhance the performance requirements beyond the Code will be considered under the auspices of this measure. Evidence suggests that levels of energy efficiency exceeding that of ASHRAE 90.1 are technically and economically feasible in Canada today.

COMMERCIAL SECTOR MEASURES

Description of Actions

Proposed actions are similar those recommended for the residential new building program. (See Measure 1.1.)

2.3 PROMOTE ENERGY EFFICIENCY MORTGAGES: COMMERCIAL BUILDINGS

The federal government, supported by lending institutions, will facilitate the development of financing mechanisms to leverage investment in energy efficient commercial building construction.

- Economic instrument
- Consumer Awareness.

Overview and Actions

This measure is similar to the proposed "Energy Efficiency Mortgage" for residential construction. (See Measure 1.2.) The following discussion highlights aspects of the commercial measure that are different from that of the residential program.

2.4 ESTABLISH A NATIONAL BUILDER TRAINING PROGRAM: NEW COMMERCIAL BUILDINGS

The federal government will develop a national "energy efficiency" training program for professionals and trades involved in the new construction of commercial buildings, and in the specification, installation, and servicing of equipment and controls. This initiative will represent an enhancement to the "Canadian Energy Management and Environmental Training" (CEMET) program.

- Voluntary
- Mandatory
- Training and Education.

Overview

One of the most important factors affecting the certainty of GHG reductions is what is referred to as the "savings persistence" of energy efficiency measures. In turn, key factors influencing savings persistence include the quality of building design; equipment installation and

MEASURES TO REDUCE GREENHOUSE GASES

commissioning; and servicing of the technical measures. Successful energy management projects that realize and sustain energy savings depend on well-informed decision makers and well-trained facility personnel. Access to effective, readily available up-to-date training materials is a key requirement for energy management projects. The existing CEMET initiative addresses this need.

CEMET is operated by Natural Resources Canada's Efficiency and Alternative Energy Program (EAEP). The program was initiated through a partnership between the Canadian Gas Association and its member utilities, Durham College and Natural Resources Canada. CEMET operates in alliance with a network of 40 community colleges, as well as industry, utilities, associations and other government bodies including Energy Training Ontario, and the Canadian Industry Program for Energy Conservation.

CEMET services are primarily aimed at energy users in the commercial, institutional, and industrial sectors, particularly clientele of EAEP's Federal Buildings, Energy Innovators and Industrial Energy Efficiency initiatives including:

- Building managers;
- Energy managers;
- Gas and electrical utility representatives;
- Maintenance supervisors;
- Technicians;
- Plant engineers and operators.

CEMET services include:

- Access to the national community college network for program delivery;
- Training needs analysis and competency assessment services;
- Tailor-made energy management training programs;
- Energy management workshops.

In order for CEMET to have more impact on energy use behaviour, a more comprehensive approach is proposed. This approach would supplement current practice which devotes a majority of resources to responding to individual or sectoral training needs. The objective would be to integrate good energy efficiency practices in the training curriculum.

An expanded program would allow CEMET to i) offer more flexible and cost effective training services and products at the development, revising/updating and delivery stages; and ii) serve more clientele from accelerated EAEP initiatives and other sources.

COMMERCIAL SECTOR MEASURES

Description of Actions

- Development of a needs assessment for training in new commercial construction and development of appropriate curricula to address the needs.
- Development of a national professional and trades "competency database": There are a variety of professional and trade allies responsible for the design, specification, installation, and servicing of energy management measures. A national database will compile and update on a regular basis information pertaining to the competency levels of the allies. The database will be a cornerstone to an integrated approach aimed at the design-build community and will serve as a reference point for competency upgrades and assessment.
- Development and facilitation of enhancements to curricula pertaining to the energy management field. At the present time, a variety of related courses are being offered at university, college, and trade school levels. The proposed action will entail: i) a situation assessment of existing courses, ii) consultation with provincial and institutional officials regarding possible course changes and enhancements, and iii) development of the course enhancements.
- Establish letters of cooperation with professional and trade associations to recognize and validate the importance of good energy efficiency practices within their disciplines. The objective would be to achieve nationally recognized and accepted certification which would allow transportability of qualifications so that trained personnel can move freely.
- Implement mandatory or voluntary "in-service" training for practising professionals and tradespeople. Most working professionals and tradespeople, especially the former, already undergo some type of formalized training and official certification of some kind. This action is based on the premise that, at some juncture in their careers, trade allies require "refresher" or enhancement of their training. Both mandatory and voluntary approaches to in-service training can involve some type of enticement, e.g., supplementary certification and listing (with recognized upgrade) in the proposed database.
- Automate existing course materials and related services to allow for cost-effective updating and distribution, i.e., clients would be able to print and modify materials to suit their own needs and study wherever they need to, in their own time and at their own pace.
- Make available consistent, high quality energy efficiency training materials from other countries to fill gaps in what is currently available domestically, and to develop new materials as required, in partnership with associations and other levels of government.

MEASURES TO REDUCE GREENHOUSE GASES

- Link curriculum development to R&D institutions to speed up the rate at which new ideas and technologies are made available to energy users and decision makers through teaching materials and curriculum.
- Develop modules for "training the trainers". This action will entail the development of methods and materials with which trainers of energy management curricula can themselves undergo training aimed at improving the quality of education in this field.

NATIONAL RETROFIT INITIATIVE: COMMERCIAL SECTOR – UMBRELLA PROGRAM

The National Retrofit Initiative (NRI) will be an umbrella program facilitated by the federal government. Under the program several targeted measures will be implemented to optimize energy efficiency opportunities and GHG reduction through building retrofit in the commercial sector.

Description of Actions

The NRI will utilize an integrated approach combining informational, financial, technical, and regulatory components to address the key barriers impeding energy efficiency in this market segment.

The NRI will comprise the following measures:

- 2.5 Establish retrofit Standards for Commercial Buildings
- 2.6 Improve Financing Mechanisms for Retrofitting Commercial Buildings
- 2.7 National Builder Training Program: Commercial Building Retrofits
- 2.8 Expand the Federal Buildings Initiative
- 2.9 Expand the Energy Innovators Initiative.

2.5 ESTABLISH RETROFIT STANDARDS FOR COMMERCIAL BUILDINGS

In cooperation with the provinces, territories, utilities, and other stakeholders, the federal government will facilitate the adoption of energy codes which will stipulate that building renovations meet prescribed energy performance requirements. For provinces and territories, adoption of the standards will be encouraged as a mandatory requirement. For other jurisdictions, advanced levels of practice will be encouraged on a voluntary basis. The initiatives will encompass a combination of regulatory, informational, and technical components.

- **Regulatory**
- **Voluntary**
- **Technology Transfer.**

This measure is similar to the proposed residential sector Retrofit Building Standards measure. (See Measure 1.6.) The following discussion focuses on aspects of the commercial program that are different from that of the residential initiative.

MEASURES TO REDUCE GREENHOUSE GASES

Overview

This measure will build upon the already existing process and experience of the development of the National Energy Code for Buildings (NECB), to be included in the new National Building Code (scheduled to come into effect some time in 1995). The NECB was developed through a collaborative process which has secured a high degree of "buy-in" from the provinces.

As in the case of the NECB, the proposed retrofit standard could include a set of mandatory requirements and then the option of pursuing either prescriptive or performance based paths of compliance. Provinces and municipalities could adopt the standard for code requirements pertaining to building renovations and retrofits. Under code requirements, the standard could be approved at the point of issuing building permits or as a condition of transferring ownership.

Two parallel action tracks are proposed:

- The development and application of the necessary tools with which provinces and other jurisdictions adopt a "consensus" code as a mandatory requirement into the existing building codes.
- Work towards the voluntary adoption of a more stringent code into renovation and retrofit practices. This level could become mandatory under the auspices of municipal jurisdictions or could form the basis for demonstrations.

Description of Actions

Refer to the proposed actions for the residential sector Retrofit Building Standards, Measure 1.6.

2.6 IMPROVE FINANCING MECHANISMS FOR RETROFITTING COMMERCIAL BUILDINGS

The federal government will facilitate the development of financing mechanisms to leverage investment in energy efficiency retrofits of existing buildings:

- Economic Instrument
- Consumer Awareness.

COMMERCIAL SECTOR MEASURES

Overview

A major issue in the financing of energy efficiency measures concerns assignment of risk. Lending institutions are reluctant to extend credit to some organizations to undertake energy management projects without a source of guarantee for the retrofit savings stream. A means of alleviating this barrier is required.

Users of the EE warranty program would pay a "guarantee" fee representative of an actuarial calculation of the default risk associated with the entire loan portfolio. The guarantee fees would form a capital pool sufficient to absorb loan losses over time. This is similar to the insurance fee paid to the Canada Housing and Mortgage corporation on CMHC-insured residential mortgages.

This measure is similar to the proposed financing mechanism for the existing residential sector (See Measure 1.7), with the important addition of an "Energy Efficiency (EE) Warranty". A warranty program would be developed to provide a guarantee for the energy savings generated from commercial building retrofits.

Description of Actions

The role of the federal government would be:

- To bring together potential users of a such a pool (e.g., industrial, commercial and institutional energy users, ESCos and energy management firms) and potential investors (e.g., insurance and pension funds) as well as other interested parties (e.g., banks, utilities, provinces, brokers) in order to explore the creation of the program;
- To facilitate creation of a third party to create and administer the program (possibly through the Canadian Association of Energy Service Companies (CAESCo); and
- To integrate the marketing of the program within its own marketing efforts of Efficiency and Alternative Energy Programs (e.g., the Federal Buildings Initiative, Energy Innovators and Industrial Energy Efficiency Initiative) to ensure uptake of the program.

2.7 ESTABLISH A NATIONAL BUILDER TRAINING PROGRAM: COMMERCIAL BUILDING RETROFITS

The federal government will develop a national "energy efficiency" training program for professionals and trades involved in the renovation, and retrofit of commercial buildings.

- **Voluntary**
- **Mandatory**
- **Training and Education.**

This measure is similar to Measure 2.4.

Overview

Conceptually, the program represents an expansion and enhancement of the "Canadian Energy Management and Environmental Training (CEMET) program. As discussed in Measure 2.4, CEMET is currently targeted towards the professionals and towards that work in the existing commercial sector. Therefore, this proposed enhancement of the program will build upon an already existing framework.

2.8 EXPAND THE FEDERAL BUILDINGS INITIATIVE (FBI)

The federal government will expand the "Federal Buildings Initiative" (FBI) to facilitate energy management investments in facilities under other jurisdictions (e.g., crown corporations and provincial and municipal facilities).

- **Voluntary**
- **Technology Transfer.**

Overview

The Federal Buildings Initiative (FBI) is a federal program that provides a mechanism for federal departments to utilize energy performance contracting (EPC) to finance and implement energy management projects within their building facilities. As defined by Natural Resources Canada, EPC is a means of implementing energy efficiency projects and reducing operating costs with no upfront costs and minimal risk to the client energy user. EPC provides a wide range of services including: building analysis, design and specifications, installation, monitoring and training, and financing.

COMMERCIAL SECTOR MEASURES

The FBI has been successful in promoting the application of EPC among federal buildings managers and has also developed mechanisms with which government departments can contract to the firms that provide EPC, referred to as "energy service companies" (ESCO's). To date, FBI has been targeted to federal facilities and, in particular, federal line departments. However, EPC is recognized as a concept that could be applied to buildings that fall under other government jurisdictions. In fact, municipal buildings are targeted by another federal program, "Energy Innovators" (see the next proposed measure). Under this proposed initiative, the federal government will facilitate the expansion of FBI to federal crown corporations as well as provincial governments.

The expanded FBI will encompass a variety of activities including: promotion, training, administrative assistance, audit services, monitoring, and evaluation. In this regard, the program will compliment already existing programs falling under the auspices of Natural Resources Canada's Energy Innovators program.

Description of Actions

As it currently exists, FBI provides federal clients a full range of services including:

- Development of strategic alliances among key user and trade ally groups;
- Development of administrative management structures;
- Identification of target buildings and establishing targets for eligible buildings to be retrofitted;
- Promotion;
- Education regarding energy performance contracting;
- Development of pre-qualified bidders lists;
- Development of model energy services contracts.

Specific actions will support the provision of these services to an extended client base; specifically, this will include federal facilities as well as other levels of government. The actions involved in this expansion include:

- Assessment of market potential, issues, needs etc.;
- Consultations with key stakeholders regarding possible role and responsibilities;
- Setting targets and schedules for implementation.

2.9 EXPAND THE ENERGY INNOVATORS INITIATIVE

The federal government will expand the "Energy Innovators" Initiative to increase participation in the municipal, institutional and corporate sectors. This will be accomplished by working with organizations that represent those sectors nationally.

- **Voluntary**
- **Technology Transfer.**

Overview

The Energy Innovators Initiative is a federal strategy designed to mobilize corporations, institutions, and municipalities across Canada to undertake energy efficiency measures in their facilities. The objective is to protect the environment and increase profitability in their operations. Commitment from the CEO or senior executive is sought to mobilize their organizations to plan for and implement energy efficiency projects. In the corporate sector, the Initiative has targeted national, retail, hospitality, and commercial buildings organizations. Because most of those organizations are headquartered in Ontario, many pilot projects have originated in that province. An expanded initiative would target subsectors within the institutional, municipal sectors, and regionally-based corporations (with facilities located in some, but not all, provinces). To date, most of the corporate target market has been recruited to the program.

Energy Innovators is linked to other federal initiatives aimed at stimulating investments in the commercial/institutional sector retrofits (e.g., the FBI program). In this regard, expansion of the program is proposed to occur in tandem with enhancements to the other federal initiatives discussed in the proposed measures.

Description of Actions

Generally, an expanded Energy Innovators Program would establish regional delivery mechanisms through contribution agreements with organizations representing these sectors nationally (e.g., through the Energy Management Task Forces or through the Federation of Canadian Municipalities for the municipal sector, or through electrical and gas utility allies). The program would also expand the Innovator challenge into the municipal and provincial arenas via transferring "technology" (mechanisms, tools) to those target sectors for application in their buildings. Specifically, this program expansion would require the following actions:

- **Undertake situation assessment of market opportunities/needs;**
- **Consult potential partners with respect to program expansion;**
- **Recruit and stimulate pilot projects in the municipal and institutional sectors.**

3. INDUSTRIAL SECTOR ENERGY CONSUMPTION MEASURES

What is the Industrial Sector?

Canada's industrial sector includes the manufacturing, mining, construction and forestry related industries. The heterogeneity and greater technical complexity of this sector makes the analysis of energy use and potential savings much more difficult than for other sectors. To date, most efforts in this sector have used the Standard Industrial Classification (SIC) system to designate the various industry groups at different levels of aggregation.

Proposed Measures

Six measures are proposed for the industrial sector:

- 3.1 Establish Industrial Efficiency Indicators
- 3.2 Promote Benchmarking/Best Practices
- 3.3 Implement an Industrial Energy Innovators Program
- 3.4 Coordinate and Promote an Electric Drivepower Challenge
- 3.5 Establish Boiler and Kiln Efficiency Standards
- 3.6 Provide a Tax Incentive for Energy Efficient Industrial Process Investments.

3.1 ESTABLISH INDUSTRIAL EFFICIENCY INDICATORS

The Industrial Efficiency Indicators measure consists of a voluntary, industry-driven approach to the promotion of energy efficiency. This initiative will expand the CIPEC program in which energy intensity or process efficiency indicators are developed for all major energy using processes in Canada and are used for the setting and promotion of voluntary industry targets.

Overview

Elements of this measure are currently being developed by Natural Resources Canada, CIPEC, the Canadian Industrial Energy End-Use Database and Analysis Centre (CIEEDAC) and others. However, under this proposed measure, the existing efforts would be expanded and the timetable for completion of key elements would be accelerated.

Under this measure, Industry commitments to action would be secured at the senior level through the Minister's Advisory Council on Industrial Energy Efficiency (MACIEE) and at the

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infrastructure level through a re-vitalized Canadian Industry Program for Energy Conservation (CIPEC). This commitment to action would be in the form of energy efficiency targets defined in reference to specific industries and process application-specific. Attainment of the set targets would be supported through the development and implementation of sector-level programs and company level workplans.

Description of Actions

An expanded initiative would involve the commitment of additional financial and human resources in 4 key areas:

- **Development of an expanded industry network.** Additional resources would allow for an expansion of the current task force network from a base of 15 to approximately 25 sectors.
- **Accelerated development of a comprehensive data base of Canadian industrial energy use, by industry and process application.** This data base is currently being established through CIEEDAC at Simon Fraser University; with additional resources the timing would be accelerated and the scope of work would be expanded.
- **Identification of energy efficiency targets.** Targets would be developed for each major industry group and process application.
- **Development of implementation plans.** Sector programs, complemented by specific company work plans, would be established to ensure attainment of the established energy efficiency targets.

3.2 PROMOTE BENCHMARKING/BEST PRACTICES

Natural Resources Canada will work with industrial energy consumers to rank, on an unattributed basis, their energy use in major industrial processes against domestic and international results for similar processes.

Overview

This program will sponsor research and analysis related to the use of energy in industrial buildings and industrial processes at a sector level (SIC - designation). Information on energy use in various processes will be collected at the domestic level from industries participating in the CIPEC program. Comparative international information will also be collected through the OECD network of countries. Domestic information will be collected through existing channels now under the auspices of Statistics Canada and Natural Resources Canada. This information

INDUSTRIAL SECTOR MEASURES

will be housed at the Canadian Industry Energy End-Use Database and Analysis Centre at Simon Fraser University. The information will be used to develop Energy Consumption Guides which show users on an unattributed basis how their energy consumption compares with that of others in the same industry both domestically and internationally. This will allow companies to perform a self-assessment of their relative strengths and weaknesses with respect to the efficiency of their processes.

Description of Actions

Natural Resources Canada, through MACIEE and its various programs, will increase its efforts to develop a comprehensive understanding of the various energy-using processes in the manufacturing sector. These efforts will be carried out in collaboration with the CIPEC network, the Canadian Industrial Energy End Use and Data Analysis Centre (CIEEDAC), Statistics Canada and federal, provincial and utility stakeholders.

Sector-specific energy end-use studies will be initiated. These studies will consist of secondary and primary information gathering on industrial processes. Literature searches of domestic and international databanks will be conducted. Gaps will be identified and primary research, involving in-plant investigation will be undertaken, as necessary.

The results of the sector-specific studies will provide base-line energy use information against which individual plants can be assessed to determine their level of energy consumption per unit of productivity relative to their domestic and international competition. The opportunity exists to rate companies according to a scale oriented around the idea of "good", "better" or "best practice".

Accomplishments of Canadian companies can be celebrated through our Energy Innovator Award program issued by the Minister under the auspices of the Minister's Advisory Council on Industrial Energy Efficiency.

The information will also provide Natural Resources Canada with an assessment of industry needs viz training, case studies, financing, human resources and other types of services which can assist companies to implement energy efficiency projects. Companies accessing such services would be obliged to register some form of energy efficiency commitment under the auspices of Natural Resources Canada's Energy Innovator Initiative as their contribution to the effort.

3.3 IMPLEMENT AN INDUSTRIAL ENERGY INNOVATORS PROGRAM

Natural Resources Canada, in cooperation with Canadian energy utilities and industry associations, will work with major industrial energy users to promote and assist the development and implementation of plant-level, five year energy efficiency programs.

Overview

This measure would expand Natural Resources Canada's existing commercial sector Energy Innovators Program into the industrial sector. The program, which would be implemented in collaboration with Canadian gas and electricity utilities, will support expanded energy efficiency penetration through the provision of a comprehensive set of services ranging from technology transfer to national marketing of successful implementation projects.

Description of Actions

The program would be focussed around four key elements:

- **Technology Transfer:** Plant energy management coordinators would be encouraged to liaise with their sector peers through the CIPEC Task Force Network. Information needs would be identified and provided through a variety of media including technical/financial training, seminar publication and case studies, targeted to process engineers, plant engineers, plant managers, etc.
- **Opportunity Identification:** In existing plants, focus would be on the conduct of detailed plant energy audits and the development of comprehensive 5 year energy management plans. In the case of new plant design or expansion, the focus would be on ensuring that there are no "lost opportunities" related to the energy efficiency of the processes and/or equipment selected.
- **Commitment to Action:** Prior to receiving program support for the identification of energy opportunities, a commitment would be negotiated, at the CEO level, to implement identified efficiency improvements that meet specified financial or economic levels of return.
- **National Recognition:** The accomplishments of participating Canadian companies would be show-cased both domestically and internationally.

Natural Resources Canada would assume a lead coordinating role with responsibilities in key areas such as identification of process engineering expertise (i.e. an industrial experts list), assistance to industry in securing financing, technology transfer and national marketing.

3.4 COORDINATE AND PROMOTE AN ELECTRIC DRIVEPOWER CHALLENGE

Natural Resources Canada will coordinate efforts with industrial energy users, drivepower manufacturers, electric utilities and others to increase the market penetration of efficient industrial electric drivepower systems.

Overview

Canadian utility and government efforts to increase the efficiency of industrial AC induction motors have achieved significant results in a relatively short period of time. The efficiency of motors up to 200 HP is regulated by standards. However, motors are but one component of larger industrial drivepower systems that also include drives and motor driven equipment such as pumps, blowers, conveyors etc. The potential efficiency gains offered by improved efficiency drives and the driven equipment are typically much greater than in the motor itself.

This program will begin with a Showcase Demonstration competition involving the selection of energy efficient drivepower applications in approximately 5 to 10 companies (plants). The energy savings and related performance impacts will be closely monitored and will be used in a national marketing effort to promote the increased penetration of the successful drivepower technologies.

Description of Actions

Natural Resources Canada, in collaboration with the Canadian Electrical Association (CEA), its member utilities and CIPEC, will launch the initial competition phase. Technical support will be provided to the participating plants by utility, manufacturer and engineering specialists. This technical support will include assistance in identifying efficiency opportunities as well as monitoring and validation of impacts.

Natural Resources Canada will also work with manufacturers of efficient drivepower equipment during this initial phase. Once candidate demonstration sites have been selected, discounted competitive bids will be sought from manufacturers with the understanding that the winning bids will receive extensive national publicity for their product.

The second phase of this program will feature a Natural Resources Canada initiated collaboration involving the participating demonstration plants, CIPEC and the drivepower equipment manufacturers. Emphasis in this phase will be on gaining national recognition for the participating companies and products as well as on transferring the results to the relevant industry group.

3.5 ESTABLISH BOILER AND KILN EFFICIENCY STANDARDS

The efforts of multi-stakeholder working groups led by Environment Canada, which are currently developing National Emission Guidelines for new and modified electric utility and commercial/industrial boilers as well as heaters and cement kilns, will be expanded to include energy efficiency standards.

Overview

The Canadian Council of Ministers of Environment (CCME) published, in 1990, phase I of the Management Plan for Nitrogen Oxides (NO_x) and Volatile Organic compounds (VOCs). The objective of this Plan is to achieve national ambient air quality objectives for ozone, a major component of smog. Among the many measures proposed in the Plan are:

- Initiative N305 -- the development of successively lower NO_x emission limits in Environment Canada's "Thermal Power Generation Emissions - National Guidelines for New Stationary Sources", published under the Canadian Environmental Protection Act (CEPA); and
- Initiative N306 -- the development of CCME guidelines for new and modified commercial/industrial boilers, heaters and cement kilns.

In the multi-stakeholder consultations for the development of the NO_x/VOC Plan, in the Plan itself, including the detailed description of initiatives such as N305, and in the working groups developing the initiatives, a consistent theme has been industry's desire to have energy efficiency addressed in measures taken under the Plan. This recognizes that reducing energy consumption will reduce emissions of all pollutants, and will likely also be associated with cost savings. One of the more prominent strategies for promoting energy efficiency is to express emission limits in terms of emissions per unit of energy output. This also provides for greater flexibility in choosing options for meeting emission limits.

In view of the increasing importance of climate change, and the National Air Issues Coordinating Committee (NAICC) directive to take a comprehensive approach to air issues, increased priority should be given to acting on opportunities to promote energy efficiency as part of the development of NO_x/VOC Plan initiatives.

Description of Actions

The working groups developing the CEPA Thermal Power Emission Guideline revisions effective in the year 2000, and the CCME emission guidelines for commercial/industrial boilers, heaters and cements kilns, will investigate standards related to the overall energy efficiency of the boiler and related thermal systems. By taking a "systems" approach, mechanisms can be

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found which will promote concepts such as combined cycles and cogeneration, which have thermal efficiencies much higher than conventional combustion systems.

3.6 PROVIDE A TAX INCENTIVE FOR ENERGY EFFICIENT INDUSTRIAL PROCESS INVESTMENTS

The federal government will provide a special tax incentive for prescribed investments to increase energy efficiency in industrial processes.

Overview

A tax incentive would be provided to industry to encourage their accelerated investment in new industrial processes and equipment that meet specified levels of energy efficiency. Efficiency standards established for Boilers (Measure 3.5) and other electrical equipment (Measure 4.1) will provide guidelines for directing incentives.

Description of Actions

Tax incentives can take different forms:

- Provide a higher capital cost allowance (CCA) (than currently applies under the Income Tax Act) or an Investment Tax Credit for investments in certain types of equipment which meet a prescribed level of energy efficiency.
- Provide a higher capital cost allowance (CCA) (than currently applies under the Income Tax Act) or an Investment Tax Credit¹ for investments which achieve a prescribed minimum percentage energy efficiency improvement.
- Reduce the sales tax on certain types of energy efficient equipment used in industrial processes.

¹An Investment Tax Credit provides a reduction in tax payable (i.e., a tax credit) which is usually a specified percentage of the amount of investment written off in a given year.

4. APPLIANCE AND EQUIPMENT SECTOR PROGRAM

4.1 STANDARDS FOR APPLIANCES AND EQUIPMENT

Federal and provincial governments will expand their efforts with respect to the regulation of minimum efficiency standards for energy-using equipment. The objective will be to: i) harmonize the level and coverage of regulated standards across Canada; ii) adopt levels that eliminate the least efficient products from the marketplace where it is economically attractive and there is significant savings potential; and iii) adopt, where feasible, technology-leading levels for regulated standards to the extent that such levels are adopted in the U.S. Steps will also be taken to streamline the process of regulations development and implementation.

Overview

Legislation prescribing minimum efficiency standards was first developed in Canada at the provincial level, in particular, in B.C. and Ontario. The provincial legislation covers goods manufactured and sold within a province.

The Federal *Energy Efficiency Act* (enacted in 1992) authorizes the establishment of regulations specifying minimum energy efficiency standards for equipment imported into Canada or traded inter-provincially. The first federal regulations were pre-published in March 1994, and development of subsequent regulations are underway.

The regulations development process, as presented for comment in Part 1 of the Canada Gazette, involves many tasks including: the technical, economic, and financial assessment of the proposed efficiency upgrades; consultation with stakeholders that will be affected by the regulations; regulations drafting; pre-publication; and publication. The current federal process for development of regulations takes about 18 to 20 months. Provincial regulations have been promulgated in less time, typically about six months.

There is considerable pressure to accelerate the regulations developmental process. In particular, a major driving force has been the need for harmonization of regulations across Canada and in the U.S. Stakeholders are seeking a harmonization of regulated energy efficiency standards across different governmental jurisdictions in order to reduce the financial burden on equipment manufacturers and to avoid creating unnecessary obstacles to international trade.

APPLIANCE AND EQUIPMENT SECTOR MEASURES

Description of Actions

This is an initiative that builds on the existing framework and the process that is currently underway. The federal government, under the direction of Natural Resources Canada, is working to accelerate the regulations development process and expand the range of products that fall under the regulations.

The acceleration of the federal regulations does not necessarily involve a significant change to the regulations development process. Consultations are proceeding with government and private sector stakeholders with a view towards acceleration of the process. The actions will include:

- Ongoing consultations with manufacturers, utilities, the provinces, and standards bodies,
- Ongoing assessments of the feasibility of increasing the minimum efficiency requirement of products that currently fall under the regulations and adding new products under the regulations.

4.2 LABELLING FOR APPLIANCES AND EQUIPMENT

The federal government will facilitate efforts to enhance the scope of product energy performance labelling, both at the federal and provincial levels. This enhancement would occur under two dimensions: federal regulations and/or provincial legislation will be changed to expand the range of products for which mandatory labelling would be required; the EnerGuide energy performance scale would be used to promote high efficiency or "premium product" levels of energy efficiency.

- **Regulatory**
- **Voluntary**
- **Information.**

Overview

The federal *Energy Efficiency Act* authorizes the establishment of regulations specifying minimum energy efficiency standards for equipment imported into Canada or traded inter-provincially. The Act also establishes the basis for regulated product categories to display the EnerGuide label. Currently, six products categories labelled on a voluntary basis. Seven product categories require mandatory labelling when the Energy Efficiency regulations come into effect.

Under the auspices of the *Energy Efficiency Act*, the EnerGuide label will not only provide information on a product's typical energy consumption, but also will indicate how the product's

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energy performance compares on a scale relative to other products that fall within the same test group.

Under this measure, EnerGuide can be expanded in two respects. First, on either a mandatory or voluntary basis, the range of categories requiring labelling would be expanded. The focus of the label would continue to be on providing consumers with energy performance data for all products tested under the regulations. Second, the label could be used to promote so-called premium efficiency products similar to what both Canadian and U.S. utilities are doing.

In order to expand the range of products categories under mandatory labelling requirements, the Energy Efficiency regulations would have to be changed. Provinces with their own minimum energy efficiency standards do not presently have the legislative authority to require mandatory labelling.

Description of Actions

Three possible scenarios can be considered:

- Federal regulations could be changed to enable labelling of products for which energy efficiency standards have been (will be) prescribed, but in the provinces that do not currently have minimum efficiency legislation;
- Existing provincial legislation could be modified to permit the mandatory labelling requirement for products that currently fall under the auspices of the provincial regulations; and
- Utilities could require EnerGuide labelling for the products promoted under their DSM programs. (Although, as discussed below, most Canadian utilities use the Power Smart logo to promote premium efficiency products.)

To support the use of the EnerGuide label in the marketplace, Natural Resources Canada is moving ahead with three areas of support:

- Selection of product categories requiring labels in consultation with stakeholders,
- Implementation of marketplace monitoring and enforcement systems,
- Comprehensive information and education campaigns to foster consumer understanding of the EnerGuide label.

The expansion of the program beyond that of the federal *Energy Efficiency Act*'s legislated authority (e.g., at the provincial level), will necessarily involve similar support activities.

4.3 IMPLEMENT A GOLDEN CARROT PROGRAM

The federal government, in association with the provinces and utilities will undertake actions to encourage manufacturers of energy using equipment to develop and commercialize products that are "advanced" in terms of energy performance. Institutions and other stakeholders would establish a capital pool and, possibly other sources of financing, to induce equipment manufacturers to participate in a "competition" requiring them to develop the lowest cost advanced product (hence, the "Golden Carrot").

- Voluntary
- Economic Instrument
- Technology Transfer.

Overview

This measure is viewed as a complementary initiative to that of energy performance standards and labelling. It is based on the notion that for certain products, it is possible to produce and find market niches for advanced performance technologies. By bringing advanced technologies to market, a successful Golden Carrot program provides standards makers with the information need to determine whether higher efficiency products are indeed technically and economically feasible.

The Canadian market may be too restrictive for an independent initiative of this nature. Therefore, an alternative to consider would be a program shared with institutions and, possibly, venture capital in the U.S. A shared approach could focus on product areas that have a high potential for energy efficiency but which, to date, have not attained major performance improvements. One such group of products is industrial air compressors, pumps, fans, and drives.

Description of Actions

- Identify market niches where there is a strong manufacturing capability.
- Identify end uses where significant energy savings can be achieved.
- Determine the extent to which advanced technologies can address market potentials.
- Establish a commitment from "partners" to establish the pool of capital.
- Encourage manufacturers to participate in the competition.

5. TRANSPORTATION SECTOR ENERGY CONSUMPTION MEASURES

What is the Transportation Sector?

The transportation sector is composed of many modes; road, rail, marine, air and special off-road vehicles (eg. for construction or agriculture). The road sector encompasses both gasoline (mainly autos and trucks) and diesel vehicles (mainly heavy duty trucks and buses). Transportation accounts for about 30% of all energy consumed, almost 65% of all petroleum consumed, and about 32% of Canada's total emissions of carbon.

5.1 NATIONAL GREEN TRANSPORTATION STRATEGY

A National Green Transportation Strategy will be developed by a federal agency with the participation of Natural Resources Canada, Environment Canada, Transport Canada, the Provinces, and representatives from municipal governments. A Green Transportation Program will promote and demonstrate least-cost transport options that fully incorporate environmental externalities.

Overview

Energy use and, more recently, environmental factors contribute to the efficiency of transportation. Other contributing factors include costs of carriers, fuel, maintenance and infrastructure, convenience, safety and time.

Canadian transport systems have been developed over the last century as technological changes have introduced new, faster, and more convenient modes of transport. Governments have played a strong role in introducing and encouraging transport modes through the use of subsidies to meet objectives such as nation-building and regional development. The pricing of transport services rarely reflects efficiency.

Conclusions from the Royal Commission on National Passenger Transportation (1992), reflected the following about passenger transportation in Canada in the 90's:

- Most travellers do not pay the full costs of the passenger transportation services they use and prices do not reflect a traveller's use of the system;
- Costs are not entirely covered by fares, licences and fees, regardless of transport mode;
- Costs are higher than necessary, because governments do not always invest in projects that result in the best value;

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- Environmental and other social costs are rarely factored into the costs of the passenger transportation system.

These conclusions are as applicable to freight transport as to passenger transport.

Description of Actions

There are several important areas where government can play an environmental role. First as a researcher and developer of climate change policy specific to transport systems. Second as watchdog, monitoring and making public the environmental indicators that the market can use to both cost environmental externalities and correct deviation from explicit environmental targets. Third as an educator and promoter of environmental transportation planning choices government can help steer decision-making that often is highly decentralized. Fourth through a system of compensatory subsidy, government can help support transport systems that minimize environmental impact while meeting or improving on other transport objectives.

To play this role effectively, strong leadership is required that can help set national environmental transport objectives, develop policies to support the objectives and allocate funds to support appropriate capital and operating expenditures at a local level. The decentralized nature of transport planning in Canada should be recognized so that policy and funding decisions are made with the full participation of all jurisdictions, and that bottom-up planning is incorporated.

A central federal agency should be given responsibility for scoping and costing environmental impacts of transportation including contributions to GHG. Ministers of the Crown will determine whether an existing federal agency should be given this mandate, or whether a new agency or body should be created. The role of this agency will be to coordinate the development of federal policy with provincial and municipal jurisdictions as well as with the transportation industry as required. The Agency would be responsible for the development of a National Green Transportation Strategy of which climate change measures would be a part. Elements of the Strategy would include:

- Scoping and costing of GHG emissions and determining a relationship with other environmental impacts such as NOx/VOC emissions;
- Identification of measures to reduce emissions, and the relationship of the measures to other environmental impact measures;
- Outreach to the municipal transport planning and operating agencies through education and promotion programs;
- Outreach on a national basis to encourage a coordinated approach to transport services that includes fully-costed environmental impacts.

TRANSPORTATION SECTOR MEASURES

- Operation of a Green Transport Program directed toward environmental transport planning and capitalization funded through an energy or environmental tax on transport fuel;
- Monitoring of efforts and achievements in GHG reductions.

The development of a Green Transport Program could be supported by tax revenues. Using taxes would have two purposes (a) conserve fuel by a modest increase in the price of gasoline and diesel fuel, and (b) create a fund to support a wide range of measures that improve the environmental efficiency of the transportation sector both inter and intra-urban.

The Green Transport Program would draw on some ideas in the U.S. Intermodal Surface Transportation Efficiency Act (ISTEA, 1991). A Canadian ISTEA, however, would have significant differences. First, a new funding mechanism would have to be put in place. Second, an Act of Parliament would likely not be appropriate to mandate compliance given the entrenched rights of the provinces in transportation issues. Rather, a Canadian federal program could be designed to release funds on the basis of compliance with the terms of the program.

This Green Transport Program could be funded by fuel taxes. These could be provided from general revenues or assessed as a 2 to 4 cent national transportation efficiency charge on all surface transportation fuels as described in Measure 5.1.

The funds would be allocated to the provinces directly, on the basis of their contribution to it. Provincial departments, with public input, would then allocate the funds towards the least cost, most effective ways of reducing transportation energy requirements and associated emissions. The Program would specify criteria for eligibility, but decisions about capital or operational expenditures would be made at the provincial or municipal level.

Funds could be used to match or complement existing provincial transit and transportation efficiency capital expenditures, but only if they meet the national program criteria.

Important criteria would include:

- Internalizing of environmental costs (externalities) in assessment of options for meeting transportation requirements;
- Least cost transportation planning and full consideration of demand reduction options before increasing transportation (usually road) capacity.

5-I VEHICLE EFFICIENCY MEASURES

5.2 ADOPT A NATIONAL INSPECTION AND MAINTENANCE PROGRAM WITHIN URBAN AREAS

Each province will adopt an inspection and maintenance program in urban centres using the CCME Code of Practice for vehicle emissions. Provincial participation would be voluntary; participation at the municipal level would be mandatory.

Overview

The major purpose of an Inspection/Maintenance (I/M) Program is to reduce excessive NO_x and VOC emissions due to engines being out of tune, or to repair defective emissions control equipment arising from faulty components or tampering.

Description of Actions

Each province would adopt the Environment Canada Code of Practice for Inspection/Maintenance (I/M) Programs. This Code of Practice was developed by the CCME with the involvement of stakeholders and researchers. It outlines the parameters of efficient and effective inspection and maintenance programs. The initial focus of I/M programs would be large urban areas.

The adoption of the Code of Practice would be a voluntary action by provinces, under whose jurisdiction implementing I/M programs falls. I/M Programs could take the form of a regulatory measure at the commercial level. A regulatory approach would involve mandated regular vehicle inspections, and action where poor performance is detected.

5.3 APPLY A GAS GUZZLER TAX

The federal government will use taxation to influence consumer new vehicle purchase decisions. A gas guzzler tax will be harmonized with the U.S..

Overview

Gas guzzler taxes are a tax on new automobiles that are less fuel efficient than a nominal fleet target efficiency.

Description of Actions

The federal government will introduce a national gas guzzler scheme harmonized with the existing U.S tax and immediately begin negotiations to increase the limits of the tax.

5.4 INSTITUTE A NATIONAL FEEBATE SCHEME

The federal government in cooperation with provincial governments will institute a Canadian feebate scheme designed to influence consumer choices toward increasingly efficient vehicles. It will be as revenue neutral as possible.

Overview

Feebate schemes impose fees on vehicles which have below average fuel efficiency. The schemes provide rebates for consumers purchasing vehicles with above average fuel efficiencies. Feebate schemes can be either revenue neutral or used to generate tax revenue for other measures. The schemes can be customized to each vehicle class, since it is more effective to influence customer behaviour within a class, rather than trying to shift customers out of a class. This feature will not penalize those manufacturers who produce a full line of vehicle classes.

Description of Actions

The federal government will create a national feebate scheme that would be built around average target efficiencies within classes of vehicles. To the extent possible the feebate program will be revenue neutral rebating to purchasers of efficient vehicles those funds which are taken in fees from inefficient vehicle purchases. The feebates would be designed on the basis of vehicle class, rather than imposing a single feebate schedule for all vehicles. Over time, target average efficiencies would be increased to move customers toward increasingly efficient vehicles.

5.5 COORDINATE AN ACCELERATED RETIREMENT (VEHICLE SCRAPPAGE) PROGRAM

Institute a provincial Vehicle Scrappage Program to provide an incentive for the retirement of the oldest, most polluting vehicles from the road.

Overview

Accelerated vehicle retirement programs provide financial incentives for the scrapping of automobiles and trucks below a fixed year. Retirement of these vehicles would in the main reduce pollutant emission but would have the added benefit of removing low efficiency vehicles from the fleet thereby minimally decreasing GHG.

Description of Actions

A scrappage program should target either pre-1975 or pre-1977 vehicles. The 1975 vehicle emissions control technology represents a significant improvement over that of 1974, while the 1977 average fleet fuel efficiency rating (14.5 l/100km) is significantly better than that of 1976 (20.3 l/100 km).

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Possible administrative approaches to a vehicle scrappage program are:

- Restriction of the program to automotive dealership transactions. Under this option, dealerships would screen vehicles for program participation and undertake most of the paperwork. Participants would then be required to purchase another vehicle from the dealership. Funding could be shared by government and the automotive sector.
- Inclusion of both private and automotive dealership transactions within the scope of the program. If participants choose to go through a dealership, this option would be the same as the option described above. However, if participants want to be able to buy another vehicle through a private transaction, the scrap yard would undertake vehicle screening. Participants would only qualify for the government share of program funding.
- Implementation of a provincial centralized and government controlled scrappage program. This option is dependent on the implementation of an Inspection/Maintenance program, as vehicles would be screened by an inspection at an I/M testing facility. Qualified participants would receive a certificate redeemable at a Ministry of Transportation Vehicle Licensing Office once their old vehicle was taken to a certified scrap yard. Under this option, governments would fund the entire program (Task Force on Auto Sector Issues, 1994).

5.6 APPLY A CANADIAN FUEL EFFICIENCY PREMIUM

Institute a fuel efficiency premium as part of provincial vehicle registrations.

Overview

Fuel efficiency premiums are similar to tailpipe emissions premiums and aim to discourage the ownership of pre-emission technology and higher fuel consumption vehicles. A fuel efficiency premium is an economic measure, consisting of an annual fee (usually a registration surcharge) based on fuel efficiencies specific to a vehicle's model year of manufacture. Those vehicles with higher emissions would be charged a higher rate.

Description of Actions

A fuel efficiency premium would be applied as an annual federal surcharge on provincial registration of vehicles.

5.7 INSTITUTE A FLEET PROCUREMENT AND MANAGEMENT PROGRAM

A voluntary national program to improve the vehicle efficiencies of government and corporate fleets will be initiated by the federal government.

TRANSPORTATION SECTOR MEASURES

Overview

A Fleet Procurement and Management Program has four main objectives:

- (i) Shift the purchase of corporate and government fleets to more efficient vehicles, including those which use lower-emission fuels,
- (ii) Provide the impetus and economies of scale required for the development and implementation of alternative fuels and advanced technologies, including the necessary supporting infrastructure and services,
- (iii) Have large fleet owners lead by example, so that commercialization and more widespread use of efficient vehicles becomes a reality, and
- (iv) Induce sound fleet operation and management, which would involve the implementation of good operating and maintenance practices to yield continued good vehicle performance. The operating and maintenance practices would concentrate on optimizing fuel efficiency and minimizing pollutants.

Description of Actions

A Fleet Procurement Program (developed by the federal government) would be a voluntary measure to encourage the purchasers of large fleets of vehicles to make bulk purchases of fuel efficient vehicles and to manage their fleets for optimum efficiency. This could apply to government fleets at the federal, provincial/territorial, and municipal levels, as well as corporate fleets. It can be modelled on the ICLEI "Green Fleets Program" and might include education and research programs. Besides providing guidelines for adoption of a Green Fleet the program could also track fleet fuel efficiencies as a means of measurement and reward (via public recognition), and provide a buying pool to give economies of scale for fuel-efficient fleet development and procurement.

The federal and provincial governments could organize pooled fleet procurement programs. Corporations, municipalities, regional, provincial and the national government could commit to the purchase of "Super Cars" and alternative fuel powered vehicles, providing vehicle manufacturers with an assured market for the development of new technologies and reducing the unit cost of these vehicles.

The fleet procurement program should be tied to a national registry and a recognition award for participants. (See Measures F1 and F2.)

5.8 IMPROVE FUEL EFFICIENCY STANDARDS FOR NEW VEHICLES

Fuel Economy Standards will be improved either on a voluntary basis (in Canada) or harmonized with increased U.S. standards.

Overview

Fuel efficiency standards in new vehicles ensure that fleet turnover will bring with it reductions in GHG emissions. New car fleet efficiencies have not increased significantly since the early

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80's. Unilateral, mandatory fuels efficiency standards (MFES) are not economic for Canada given our small (10%) share of the North American market. Motor vehicle manufacturers argue that fleet efficiencies are driven largely by demand and, given relatively low stable fuel prices, the market is not moving to more efficient vehicles. Others argue that regulating market standards is one of the best ways to move to higher efficiencies.

Description of Actions

This measure can be implemented from two approaches.

- Due to the importance of harmonized standards with the U.S., the first approach would be to pursue harmonization with the U.S. Canada will begin negotiations with the U.S. to set targets for continental fleet fuel efficiency. This approach could have a greater impact on motor vehicle manufacturers than a unilateral Canadian standard. The key issue will be to raise the fleet average fuel economy. Mandatory fleet fuel efficiency standards would create a "floor" fuel efficiency for vehicles, while other measures would be used to encourage even higher fuel efficiencies.
- Negotiate higher voluntary standards with vehicle manufacturers. This would be a voluntary unilateral Canadian initiative where vehicle manufacturers would encourage the voluntary initiation of higher vehicle fuel efficiencies in harmony with the U.S. standards, but without the attendant regulatory costs imposed on government, industry and consumer. Natural Resources Canada has had the responsibility to study and recommend new targets. They will therefore undertake to set new standards and to negotiate compliance with the motor vehicle manufacturers.

Voluntary agreements will be reached with the major Canadian motor vehicle manufacturers to escalate average fleet fuel economy standards by the year 2000 as part of the National Climate Challenge Program. Voluntary actions that result in GHG reductions will be registered.

5.9 INCREASE MOTOR FUEL TAXES AND PRICES

A surcharge will be applied nationally to motor fuel. Revenue from the tax will be available through the National Green Transport Program. Revenue will be shared with the provinces to support the goals of the program.

Overview

Experience has shown that in the longer term fuel prices are an effective way to influence consumer behaviour to travel more efficiently. An increase in revenues can also be used to support other program for GHG reduction.

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Description of Actions

At present, gasoline taxes amount to approximately C\$0.25/litre. An incremental relatively small "green" tax will be imposed to send a message to consumers and to help finance other reduction measures.

The incremental tax would be applied at the federal level, but funds raised in a province would be returned to that province. Funds raised through this action would be dedicated to a number of greenhouse gas abatement strategies. Public education, municipal and intercity transport efficiency measures, research into alternative transportation fuels, incentives to reduce market barriers to adoption of transportation alternatives, alternative fuels and more efficient cars based on criteria developed by a National Green Transportation Strategy. (See Measure 5.1.)

Several options may be pursued:

1. Impose an incremental green tax immediately of C\$0.02/litre.
2. Impose a gradually increasing tax over time.
3. Maintain the real gap with expected U.S. gas price increases.

Funds should be allocated for education programs to inform the public about how the additional revenue is to be used.

5.10 PROVIDE INCENTIVES FOR ALTERNATIVE TRANSPORTATION FUELS

Subsidies and incentives to alternative transportation fuels will be set. They will be based on an accounting of environmental impacts such as GHG and Nox /VOC emissions. Support will be given for the expansion of the Canadian ethanol industry by, for example, developing a staged target for a gasoline blended with 10% ethanol. Funds will be allocated for the construction of a pilot commercial scale ligno-cellulosic ethanol production facility and to promote more widespread commercialization of the fuel.

Overview

Alternative fuels have the potential to reduce dependence on oil imports, decrease the air pollution caused by the use of conventional fuels, and mitigate greenhouse gas emissions. Certain alternative fuels offer lower tailpipe emissions than conventional fuels, but higher emissions in fuel supply. In comparing the environmental impact of alternative fuels, it is essential to analyze lifecycle emissions from fuel production, conversion, and supply, as well as from vehicles (OECD 1993).

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There are a range of energy carriers that, in principle, can substitute for gasoline in cars, and offer lifecycle greenhouse gas emission abatement potential. OECD has estimated in percentage of abatement potential relative to gasoline for various fuel types, as shown below:

- i) less than 10% - compressed natural gas in existing engines
 - methanol from coal or gas
 - ethanol from high-input corn using fossil fuels for conversion
 - electric vehicles using electricity from coal- or oil-fired plants
- ii) 10% to 25% - diesel, liquefied petroleum gas, compressed natural gas in optimized engines
 - electric vehicles operated on some existing power generation mixes
- iii) 60% to 80% - methanol, hydrogen, and ethanol that is derived from wood (or other low-input biomass), with some fossil fuel input
- iv) 80% or more - hydrogen produced by electrolysis of water using renewable electricity sources
 - electric vehicles powered by renewable sources
 - alcohol or hydrogen from biomass without fossil fuel inputs

Estimates of emission reduction depend on many local factors and assumptions. State-of-the-art ethanol from corn production plants are providing reductions by capturing exhaust CO₂ and marketing it to soft drink manufacturers and others. A plant in Illinois exhausts CO₂ to greenhouses. Comparisons of ethanol from ligno-cellulosic and from grain or corn are currently inaccurate. There are no commercial installations of the former in Canada while technical problems remain in economically separating cellulose from the binder lignin and in converting cellulose to simple sugars. Grain and corn ethanol production, on the other hand, is widespread and the technical and economic parameters of its use are well understood .

Description of Actions

There are three actions to be taken:

1. Reformulate support and incentives to reflect the atmospheric pollutant contribution of different fuels. Provide incentives on a graduated basis.

Tax and support policies will be reviewed and adjusted in order to reflect the goals of the national Green Transportation Strategy. Taxes and support should reflect the lifecycle greenhouse gas emissions and other atmospheric pollutants (Nox, VOCs, SO₂) of the source. Support for different fuels should be graduated, with those fuels producing lower lifecycle emissions receiving higher subsidies.

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2. Mandate gasoline blends with ethanol.

Reaching a 10% blend of ethanol could be phased-in as increasing percentage targets or requirements over the years, such as: 2.5% by 1997, 5% by 2000, 7.5% by 2003, and 10% by 2005. Ethanol would replace fossil-fuel based oxygenates as octane enhancers. Currently, ethanol does not exceed 7.5% of blended gasolines, primarily due to economic and marketing considerations. However, as ethanol blend gasolines become more widely accepted, consumers could accept a higher price for increased ethanol content. This could be marketed to consumers based on increased environmental benefits. Consumer preference is reported to be growing.

A complementary action would be to sponsor a broad-based educational program with motorists, truckers, and farmers advising of the environmental and health benefits from ethanol blend fuels.

3. Finance the design and construction of a ligno-cellulosic ethanol pilot plant in cooperation with private investors.

The objective of commercialization programs would be to stimulate the development and wider use of ligno-cellulosic ethanol, to the point where it can be made commercially available at convenient locations and competitive prices.

5.11 IMPLEMENT A VEHICLE EMISSIONS LABELLING PROGRAM

Label vehicles to show their emissions performance. Institute an information and public awareness program.

Overview

Emissions vary widely from vehicle to vehicle. Currently, consumers do not have access to this information. By labelling vehicles to show the emissions produced by that vehicle, consumers can be influenced to choose less polluting vehicles. Manufacturers and dealers would also be provided a means to market cleaner vehicles. An emissions index would provide a basis for a fuel efficiency premium.

Description of Actions

The emissions index would rank vehicles according to emissions test results. Provincial or federal governments would publish the data (similar to the fuel economy guide).

There are two possible tracks for this measure:

Track 1: Manufacturers label lowest-emission vehicles on a voluntary basis (similar to Power Smart), supported by a government-led education/public information campaign.

Track 2: Provincial or federal governments require all vehicles (new and used) to be labelled, prior to sale, with a decal showing the emissions index. This could also be supplemented by a government-led education/public information program.

5.12 IMPLEMENT R&D PROGRAMS FOR ADVANCED VEHICLE TECHNOLOGIES

Using federal mechanisms such as investment tax credits and research funding, stimulate R&D in advanced vehicle technologies which use alternative non-fossil fuels with low life-cycle greenhouse gas emissions, and in new vehicle designs which improve energy efficiency.

Overview

There is increasing world interest in "clean car" (nonpolluting) and "super car" (very fuel efficient) technology. Canada must seek ways to position itself for the rapid changes which are expected in vehicles by the beginning of the 21st Century.

Description of Actions

This measure would encompass a coordinated, targeted set of research and development programs to further advanced car and other vehicle (such as buses) technologies. Such programs would consist of allocating funds to the design of environmentally sound, cost effective technologies and the development, testing, and demonstration of such technologies. The R&D programs would be conducted in concert with promotion and commercialization initiatives.

A national R&D fund will be established to finance promising new technologies such as hydrogen fuel cells, or research into aluminum body technology. Private sector firms would have to submit research proposals in order to receive funding. It would be important for the government to work with private sector interests in ensuring that those technologies funded were commercially viable without government support once they had matured. The government and the private sector should look to develop their technologies as part of a larger international effort, similar to how the Canadarm was developed as part of the NASA space program.

5-II URBAN TRANSPORT MEASURES

5.13 PROMOTE INCREASED DENSITY IN URBAN AREAS

Increase the population density in urban areas by revising zoning codes and traditional urban planning practices and policies. Specific activities would include:

- **Develop a national urban growth management strategy**
- **Develop a national model for transit friendly zoning by-laws and ordinances**
- **Preserve existing rail corridor rights-of-way for future rapid rail use.**

Overview

The layout of a city has a significant impact on the choice of transportation mode, frequency and length of motorized trips taken. The amount of GHG emissions increases with frequency and length of motorized trips. Numerous studies of the relationship between land use, public transit and energy consumption, have shown the following relationships:

- Lower densities and segregated end use encourage more travel and higher per capita gasoline use.
- Building more roads leads to greater auto dependence and rarely resolves congestion problems.
- More rapid rail services on dedicated rights-of-way would allow transit services to be more competitive with the private automobile.
- Residential densities of 30 to 40 people per hectare are associated with a more transit-oriented, less auto-based urban transportation system (Newman and Kenworthy 1989).
- Mixed use areas which combine residential with commercial/industrial buildings (i.e., mix uses so that residences, jobs and services are roughly balanced on a local scale) tend to have lower traffic and parking requirements (ORTEE 1992) indicating less use of private transport.
- Higher urban densities foster less personal-vehicle dependent cities.

"Planning for increased densities and more mixed land use will reduce auto dependence on the private auto, shorten trip lengths and encourage modal shifts to walking, cycling and transit...", provided the planning process also incorporates these other TDM measures. (CERI 1994)

Transportation energy use and emissions are reduced because higher population and more compact housing means: more effective transit services can be provided economically; more neighbourhood shops and services can be provided within walking distance; and with more people living closer together, ridesharing can be better facilitated. (CERI 1994)

Description of Actions

The TDM National Program (part of the National Green Transportation Strategy) will provide the forum for a planning framework, funding and outreach to the general public for this measure.

Specific actions within the Program that would assist with increasing urban density include:

- I. Develop a national urban growth management strategy.** This is a voluntary measure that would be jointly undertaken by representatives from federal, provincial and municipal governments. The goal of this action would be to develop a set of guidelines for urban design and redesign which would foster mixed use land zones, higher density nodes and greater use of public transit while strictly limiting low density sprawl and protecting agricultural land. It would also address urban infrastructure coordination (such as the coordinated siting of stations for different modes of public transport). For example, high density development interested with, rapid transit and medium density development related to surface transit. (Metro Planning 1994) The strategy could draw on work currently being done by the cities of Vancouver and Toronto and could recommend a number of pilot projects. Such a growth strategy would require the support of complementary TDM measures.
- II. Develop a national model for transit friendly zoning by-laws and ordinances.** This voluntary measure would be jointly undertaken by federal, provincial and municipal governments. Its goal, would be to increase the use of public transit by changing zoning regulations. As an example this could be achieved, by permitting apartments in single family residential zones or allowing certain types of mixed use zoning which would allow closer siting of services that communities need. This action could either be a stand alone action or could be rolled into the growth management strategy indicated above.
- III. Preserve existing rail corridor rights-of-way for future transit use.** Currently, rail use is declining and rail rights of way are being fragmented. Rail transportation may be key to increasing mobility without increasing personal vehicle congestion and emissions. This action is designed to preserve all public travel options while the country assesses its overall transit needs and priorities. This regulatory and economic measure would require cooperation across all levels of government to allow governments to hold rail corridors in trust until such time as they are needed for transit. This action could be coupled with the management strategy to encourage urban growth along abandoned rail corridors, reducing the need to build new infrastructure to new communities.

5.14 ENCOURAGE TELECOMMUTING AND ALTERNATIVE WORK STRATEGIES

As part of the national Urban Transport Demand Management Program, telecommuting and alternative work strategies should be encouraged. This may be accomplished by:

- Strengthening existing telecommuting, compressed work week, and flex-time programs, and
- Encouraging new telecommuting, compressed work week and flex time programs.

Overview

Telecommuting and alternative work strategies have the potential to reduce both the number of work related trips and the timing of work related trips. This would result either in the direct reduction of GHG tailpipe emissions and/or shift the timing of the reductions from the peak congestion periods.

Telecommuting has been described as the movement of information instead of people (ORTEE 1992). It refers to job-related work that is performed by the worker at a base location other than the central office. Telecommuting involves using electronic communications media (such as fax machines, modems and teleconferencing) from home, a neighbourhood office or a company satellite office, instead of going to the office or travelling from the office to meetings at a third location. Telecommuting options are expected to increase dramatically as information highways (e.g., Internet, Freenet, etc.) in Canada and the U.S. are built.

There are three general categories of telework offices. A **satellite office** is a "branch" office, established by the employer in a suburb, with full support services. A **neighbourhood office** is office space located in the neighbourhood of the employee and shared by workers from other companies. Support services and electronic equipment may be individually owned or shared. A **home office** has the employee working out of his/her home and may be linked through computer modem and other equipment with the main office.

Telecommuting options may be practised by one or more individuals in a company, on either a full-time or part-time basis. Although not all jobs, or individuals, are suited to telecommuting, many are.

Alternative work strategies are those that allow employers or employees to stagger the times at which employees work (flexhours) and/or compress their work schedule to put in a full week of work in less than five days.

Description of Actions

Among the actions that can be undertaken to encourage telecommuting and alternative work strategies are these two:

- I. Strengthen existing telecommuting, compressed work week, and flex-time programs.** Most existing programs are voluntary. This action would encourage businesses and governments to broaden existing programs, for example, by increasing flex hours (for example, so that the 8 hour work period overlap with as few as five hours of the traditional 9-to-5 day, allowing employees to work from 6 a.m. to 2 p.m. or 11 a.m. to 7 p.m.) or allowing employees to work from a home office more frequently. One way to strengthen such programs could be to develop a draft set of national guidelines for telecommuting and alternative work strategies.
- II. Encourage new telecommuting, compressed work week and flex time programs.** In order to encourage additional programs (and compliance with existing programs), government agencies could offer tax breaks or other financial incentives tied to the number of employees participating in alternative work strategies. These would be offered to companies and other organizations and then could be passed on, in part or in full, to employees. This could also be done by amending the Income Tax Act to allow those working at home part time to take advantage of tax benefits offered to small businesses operating out of the home. Also, mandatory trip reduction by-laws could be used to implement variable work hour programs.

"While it may be difficult for government to implement variable work hours outside of their own offices, the sheer size of Canada's municipal, provincial and federal government civil service would mean that greater use of variable work hour schemes by government would have a sizeable impact on the duration of peak travel and congestion in many Canadian cities." (CERI 1994)

5.15 IMPROVE CYCLING AND WALKING ENVIRONMENT

As part of the federal Urban Transport Demand Management Program, cycling and walking for commuting purposes are to be improved and promoted. This may be facilitated by:

- Redesign of bicycle routes, and
- Redesign of cities to be pedestrian friendly.

Overview

Cycling and walking are two of the cleanest and most energy-efficient forms of transportation. For each motorized trip that is switched to cycling or walking, a 100% reduction in vehicle emissions results for that trip. Many car trips are performed within reasonable cycling (8 km)

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or even walking (2 km) distance (CERI 1994). Moreover, switching short trips to cycling and walking will achieve greater savings than long distance modal shifts because more pollution results from cold starts. Many analysts state that a more balanced split between providing for automobiles, and providing services for cycling, walking and transit is much more likely to result in less congestion and pollution than our current focus on automobiles alone. (CERI 1994)

Each person who cycles or walks, instead of using a car, avoids releasing 2.6 grams of hydrocarbons, 20 grams of carbon dioxide and 1.6 grams of NOx per passenger-mile. (Gordon, 1991).

A number of actions could be undertaken which would encourage people to cycle or walk in lieu of short driving trips. The focus would be to improve the safety and convenience of the walking and cycling environments. Further, cycling or walking can often be combined with transit trips, as people cycle or walk to nearby transit stops or stations.

According to a Toronto survey, 89% of respondents said concern for safety discourages bike use. Their primary concerns were traffic conditions, lack of bike lanes, and road conditions. Approximately 27% of cyclists who do not cycle to work or school said they would if safety were improved (e.g., provision of bike lanes). (CERI 1994) According to an Ottawa survey, between 5% and 10% of daily commuting trips in Ottawa-Carleton are currently made by bicycle during peak cycling season.

Description of Actions

- I. Redesign bicycle routes.** Make bicycle lanes and paths eligible for municipal land grants. This economic and regulatory action would make it less costly for municipalities to create and upgrade cycling paths. Create a grid of HOV lanes to be shared with bicycles to facilitate commuter trips on bicycle. Provide significantly more (and more secure) bicycle parking facilities at "destinations" such as public buildings and facilities, shopping centres, government buildings, office buildings, and transit stations. Make roads safer: curb lanes wide enough for bus and bike, fill-in potholes, sewer covers that do not snag bike wheels, slow the posted speed and enforcement protecting cyclist (and pedestrian's) rights-of-way (re: vehicles turning right). Providing numerous and secure bike parking facilities (which are common in Europe and Japan) will help encourage cycling. A higher level of motorist awareness of cyclists and enhanced programs to improve defensive cycling skills is also needed.
- II. Redesign cities to be pedestrian friendly.** When developing or redeveloping urban areas, consideration must be given to make walking safer, convenient, and pleasant. Cities should suggest (for voluntary implementation) or mandate new design and redesign criteria which focus on narrower street widths with bicycle thoroughfares, smaller turning radii at intersections and greater pedestrian access to arterials from residential areas. Create a pleasant environment for walking: sidewalk trees, benches, fountains, wide sidewalks, free of obstructions (including store vendor displays), barriers to prevent splash of puddles and slush from vehicles onto the sidewalk. Create a safer environment: good lighting during the evening periods, a clear sight line that allows the pedestrian to

see far in the direction headed and build sidewalks in all urban street systems. Create a more convenient environment: less distance between residences and employment areas/services, more pedestrian crossways, create pedestrian walkways over/under major arterial expressways at frequent intervals and better access to transit stations.

5.16 INCREASE TRANSIT RIDERSHIP

Increase transit ridership in Canadian cities through integrated municipal transportation plans which include transit improvements.

Overview

Increasing the modal share of transit systems is a transportation demand management (TDM) measure that will result in a reduction of GHG, on a passenger-km basis, as people switch from SOVs (single occupancy vehicle, e.g., a car). There are several reasons to support greater public transit use: it provides an essential service to those without the option of a car; it is more economic than the car, for both the city (reducing road infrastructure, etc.) and the individual (reducing taxes); GHG emissions (HC, CO, NO_x, CO₂) are reduced on a per passenger basis when comparing a SOV and a 40 passenger bus (see Table 5.4 at the beginning of Section 5-II, and Tables 5.5 and 5.6 below); transit vehicles are generally 2 to 6 times more energy efficient than a car, and during peak periods with maximum passenger loads, they are 7 to 15 times more efficient on a passenger-km basis; and transit plays a significant role in easing traffic congestion.

According to public opinion surveys (CERI 1994), the major reasons why transit's share is small is the lack of frequent service, safety and inconvenient bus service. Lack of seating space during rush hours, lack of privacy and availability of cheap or free parking for cars also contribute to the dominance of the private auto. (CERI 1994)

To overcome these impediments, various changes can be made: improve the level of service, more user-friendly transit, improved fare structure and method of payment, increase the number of measures that give transit priority over other road users and reduce travel time.

The direct costs of public transport can be covered by itself when ridership is high. This is true when transit serves the downtown core. However, as transit services try to serve suburban areas, cost-effectiveness becomes more difficult. Transit users must pay a fare to travel, which is often greater than the out-of-pocket fuel costs for driving. It is more difficult to increase the benefits of driving, therefore the benefits of SOV must be decreased.

Methods to improve public transit include extension of rapid transit, light rail and commuter rail networks, increased frequency of service, improved regularity, more effective communication with passengers, enhanced safety and lower fares. Improving service will require voluntary action on the part of transit providers in cities across Canada. Improvements in capital stock will need to be made with the assistance of municipal, provincial and possibly, federal

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governments. As well, regulatory changes are needed to level the playing field in terms of taxation for personal vehicles and public transport.

Descriptions of Actions

The National Green Transportation Strategy through its TDM program will assist in developing strategies for improving transit service and increasing ridership in urban areas in order to increase transit ridership in large urban centres by 2000. These might include means to coordinate transit systems across municipalities, integrate rapid transit, surface transit and commuter rail networks, supplemental "private" transit systems to bring passengers in from the suburbs, transit system priority measures (e.g., transit lanes, signal priority), new fare schedules, transferable, multi-modal transit passes and other innovative fare media and methods to accommodate new passenger needs (such as bicycle cars on trains). The strategy could also rank transit service in major centres across the country. Cities would have an economic incentive to improve poor transit ratings: new businesses often locate in cities with excellent transit.

Funding for capital improvements would be available under a National Green Transportation Fund and would be made available on the basis of an integrated plan which showed transit improvements as part of a least-cost TDM transportation plan.

5.17 PROMOTE RIDESHARING

As part of the federal Urban Transport Demand Management Program, set targets for ridesharing:

- **Provide free parking for ridesharing vehicles**
- **Develop a national rideshare pilot project.**

Overview

Ridesharing (or carpooling) occurs when two or more people travel in a single vehicle, sharing the costs of commuting. It is used most successfully for work trips and reduces total vehicle kilometres travelled (VKT) by increasing the occupancy in cars or vans. Provided this increase in HOVs (high occupancy vehicles) results from a switch from SOVs (single occupancy vehicles), a reduction in GHG emissions will result. The amount of GHG reduction will depend on the number of SOV trips avoided.

Ridesharing typically occurs either as a carpool or vanpool. It requires that similar origins, destinations and schedules be coordinated so as to find a "match". In carpools, participants generally take turns driving each other to work. In vanpools, which are generally run by the employer, the vanpool driver keeps the van after hours and pays lower participation costs to offset the inconvenience of picking up all other pool members.

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A good ridesharing program can "*increase* average vehicle occupancy and *reduce* vehicle-trips, vehicle-kilometres of travel, air pollutant emissions and conserve energy -- particularly during peak periods." (Transport 2021, 1993)

Description of Actions

Actions that can encourage ridesharing include:

- I. **Provide free parking for rideshare vehicles.** The goal of this action would be to provide an incentive to potential carpoolers that is not available to single occupant driven cars. Employers can provide tax-free, free, reserved parking to carpool members and charge for the limited number of parking spaces available to SOVs (Section 5.20).
- II. **Develop a national rideshare pilot project.** The goal of this action is to demonstrate the conditions and policies that lead to increased use of carpools, primarily in work trips but also in non-work trips to popular destinations such as malls. The project would include various techniques that have shown to increase the success of carpooling such as: HOV lanes, preferential parking, guaranteed ride home policies, tax credits and insurance breaks to encourage participation. The pilot project could be funded jointly by federal, provincial and participating municipal governments and businesses and would be coordinated under the Transport Demand Management Program.

5.18 PROMOTE FULL-COST ROAD PRICING

As part of the federal Urban Transport Demand Management Program, promote regulatory full-cost road pricing:

- **Apply a royalty or surface lease on transportation infrastructure**
- **Develop a full or marginal cost pricing system for infrastructure**
- **Implement Area Pricing Strategies for city core areas.**

Overview

"Among the most significant barriers to efficient transportation management are the inaccuracy of price signals in reflecting the full social cost and the lack of more efficient transportation alternatives" (NAS/NAE/IOM 1991).

Road pricing refers to applying a user fee on some or all roads. It rations scarce road space by charging vehicles for access to specific areas at all or specific times and days. Road pricing is a regulatory measure that falls under provincial/municipal jurisdiction. Using road pricing as a means to increase the cost of SOV driving will encourage SOV drivers to switch to other transportation modes, thereby reducing the emissions of GHG. The amount of GHG reduction depends on the mode shifted to and the number of SOV trips eliminated.

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Generally speaking, road pricing has a strong effect. In addition to reducing congestion in peak periods, it encourages switching to higher occupancy vehicles, transit and cycling because trips would become relatively more expensive on a per person basis thus reducing fuel consumption and emissions. It has the added benefit of increasing the efficiency of both trucks and buses by increasing average operating speeds.

Description of Actions

The following three actions will implement road pricing. In order to determine the price to be charged, a full-cost approach must be taken. The full-cost will take into account all costs associated with the road infrastructure and environmental and human health costs of emissions pollution.

- I. Apply a royalty or surface lease on transportation infrastructure.** This action requires that owners of infrastructure pay the government a set fee per kilometre owned based on the opportunity cost of land used, the cost of maintenance and a fee for damage to the environment. Since, in practice, the Crown owns most roads, this would encourage the Crown to implement full cost accounting in their pricing of road transport. This economic action might encourage privatization of roads which would also pass on the cost of road use to the users.
- II. Develop a full or marginal cost pricing system for infrastructure.** This action is a variant of the above action. It would require that users pay more for roads and that builders pay part or all of the additional cost associated with road infrastructure for new communities. Provincial and/or municipal regulations would need to be developed to enforce this action. In addition to discouraging road use, this action would encourage more compact urban form.
- III. Implement Area Pricing Strategies for city core areas.** This action would charge commuters for entry into a cordoned inner-city area to discourage auto use in urban areas. Prices charged for entry to the core could vary depending on vehicle occupancy: public transit vehicles would be exempt, carpools would pay a minimal fee and vehicles holding a fewer than four occupants would pay a larger sum. Municipalities and/or the provinces would need to manage this type of economic instrument.

5.19 PROMOTE FULL COST PARKING AND PARKING MANAGEMENT

As part of the federal Urban Transport Demand Management Program, promote full cost parking (public and private). To accomplish this:

- Amend the income tax act to make employer-provided transit passes a tax-free benefit
- Require full cost parking incorporating environmental externalities (public and private lots)

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- **Amend the building code and/or local zoning by-laws to reduce the number of car parking spaces required for each development.**

Overview

One of the major determinants of private auto use in urban areas is the availability of free or low-cost parking. Parking pricing and supply, therefore, are TDM measures that have the ability to encourage both changing the modal split and increase auto occupancy. By encouraging a modal shift away from SOV use, an immediate reduction of GHG emissions will result. The reduction depends on which alternative modes will be used.

One of the basic principles of TDM parking management, is creating a level "playing field" between the cost of driving alone and other alternatives. This means reducing or eliminating both direct and hidden parking subsidies, thus passing on to the consumer the market price of parking. Full cost pricing must also take into account the environmental costs of the transportation modes. Full cost parking, therefore, would encompass policies or programs that reflect the full environmental and social cost of driving a personal vehicle into the urban central business district (CBD).

The introduction of full cost parking should be supported by the supply of transit, ridesharing programs, cycling and walking facilities, etc., since the demand for these services will increase as people shift from SOVs.

Description of Actions

The following actions are meant to discourage SOV use by removing parking subsidies, etc., limiting the supply of parking and requiring parking to be priced at its full cost.

- I. **Amend the income tax act to make employer-provided transit passes a tax-free benefit.** Recently, the Income Tax Act was amended to make employer-provided parking a taxable benefit (prior to the amendment, employer-provided parking was tax-free). In practice, however, it is difficult for Revenue Canada to assess because most parking is integral to the place of work. This regulatory action would offset the subsidy associated with free parking by allowing employers to provide transit passes as a tax-free benefit to interested employees.
- II. **Require full cost parking incorporating environmental externalities (public and private lots).** In many cases, parking fees (when charged) only cover operating costs, not capital and land costs. Nor do they cover indirect costs "such as air pollution, congestion, and a sprawling, inefficient land use pattern." (CERI 1994) Charge *drivers* for the cost of using land and resources (including air as a sink for pollutants). Also, "parking occupies land that could be used for other purposes such as residences, commerce or green space. Indeed, land devoted to parking means lost tax revenues from the activities it precludes..." (CERI 1994) In addition, the greater the supply of parking, the more traffic it will generate thereby increasing congestion and road maintenance costs. In cases where businesses own or rent their spaces, government

should require that these spaces be paid for. This action could be encouraged through a voluntary recognition and rewards program or through an economic incentive such as a rebate for each space no longer required by a company. Long-term parking discounts promote commuting and should be discouraged.

- III. Amend the building code and/or local zoning by-laws to reduce the number of parking spaces required for each development.** Currently, builders and planners are required to allocate a certain number of parking spaces per square foot of building. Often, the space allocated to cars is greater than that allocated to office space. (State of the World, 1994) This action would require provinces and/or municipalities to alter regulations and zoning by-laws to reduce the number of parking spaces required per development and could require them to add bicycle racks and shower facilities in exchange for still lower parking facility requirements.

5-III INTERCITY TRANSPORTATION MEASURES

5.20 DEVELOP HIGH SPEED RAIL SYSTEMS FOR HIGH DENSITY CORRIDORS

As part of the National Green Transportation Strategy, develop high speed rail systems for passenger transport along high density corridors. Make funding available for capital improvements and demonstrations.

(Transcontinental and short-haul passenger travel outside of high density corridors, are not reviewed here. This measure compares the use of high-speed rail vs. existing travel modes such as bus, conventional rail and private auto.)

Overview

High speed rail systems compete successfully with aircraft or automobiles on a performance basis for some inter-city travel. Energy consumed per passenger-km is significantly lower than with auto or air travel alternatives. (USEPA 1990) The amount of GHG emissions released varies by mode, and technology. Emissions per passenger-km are dependent on the load factor and on how the electricity to run high speed rail is generated. Given that Ontario and Quebec generate most of their electricity from hydro and nuclear power, emissions of GHG associated with high speed rail will be low in those provinces.

High speed rail offers a number of advantages, including travel time savings and reduced GHG emissions per passenger-km. A study by Transport Canada (1990) modelled several scenarios in which different modal shares were influenced by the advent of new technologies such as high speed rail. It found that if high speed rail service were provided in the Windsor-Quebec Corridor it would attract sufficient business from energy inefficient modes such as auto and air (and conventional rail), and would result in an overall decrease of transportation GHG emissions in the Corridor over the projected baseline scenario. (The scenarios assumed load factors of 75% for all rail and bus.)

Description of Actions

A federal-provincial task force will be formed to plan and develop a high speed rail system in the Windsor-Quebec Corridor (or some portion thereof). This would set the stage for full implementation of high speed rail in the corridor.

5.21 ENHANCE PASSENGER AND FREIGHT SERVICE COMPETITIVENESS

As part of the National Green Transportation Strategy, introduce full-cost accounting and user-pay principles to passenger and freight transport in Canada.

- Remove Subsidies and Special Taxes on Road and Rail
- Implement Full-cost Road Use Charges.

Overview

Freight transportation modes include truck, rail, marine and air. Passenger transportation modes include private auto, air, rail and bus. The current modal share of each reflects existing factors such as cost, convenience, travel time and available modal choices. Influencing the modal share are subsidies, taxes and other regulatory controls that can limit the cost-effectiveness of a system. However, due in part to the current subsidy/tax burden split, road/highway travel is greatly favoured over rail.

In order for the marketplace to determine the most economic transportation measure for a given purpose, the true or full-cost of the mode must be clear. Travellers should pay for the true costs of the travel services they use, including those for damages to the environment, and people who do not travel should not have to pay for those who do. At present, taxpayers support the transportation system through direct subsidies and through hidden subsidies. If transportation modes face market pressures, then they will respond to consumer preferences, reduce costs, improve efficiency, and pass resulting savings on to travellers. (Royal Commission 1992)

Removing subsidies and taxes, and implementing full-cost pricing (which incorporates environmental damage, e.g., GHG emissions) will derive a "level playing field" allowing different modes of transportation to compete on a true cost basis. These changes must be made across the board at the same time so as to not send incorrect market signals that one mode is cheaper than another simply because its subsidies have been removed while other modes' have not.

Passenger Travel

Emissions of HC, NO_x, CO₂ and CO vary by mode, load factor, distance and technology, for both passenger and freight transport. *Long-haul* passenger travel by train requires dining and sleeping facilities, the average passenger capacity per car is low, making it an inefficient means of transport. On long-haul transcontinental passenger trips, emissions per passenger-km of HC, CO₂ and NO_x are highest from existing conventional passenger trains and CO emissions are highest from cars. For *short-haul* regional travel, the modal efficiency for passenger travel from highest to lowest is: bus, auto, air, passenger rail. This assumes air travel is based on fuel-efficient modern turboprop aircraft. Passenger rail ranks poorly because of low load factors. For short-haul regional trips, passenger train accounts for the highest level of HC and NO_x emissions and the automobile shows the highest levels of CO and CO₂ emissions. Thus, based on the *present* (i.e., existing equipment and load factors) conventional rail system in Canada,

MEASURES TO REDUCE GREENHOUSE GASES

passenger rail travel is not highly fuel efficient on both long-haul and regional short-haul travel. Overall, intercity bus appears to produce the lowest of all emissions per passenger for passenger transport outside of high density corridors. (Transport Canada 1990) Bus travel has a much lower modal share than private automobile.

Freight Travel

At the aggregate national level, rail *freight* is the most efficient user of energy (in tonne-km terms). Class I and II trucks and for-hire carriers use more than three times the fuel required by railway freight. The emissions released by freight modes varies by mode and load factor for each emission. Rail releases the lowest emissions per tonne-km (1988 level) for NO_x, HC, CO and CO₂. Trucks release the most (vs. rail, marine and air) of NO_x, CO and particulate matter, on a per tonne-km basis. (Transport Canada 1991) In terms of energy efficiency, rail consumes 313 kJ/tonne-km whereas trucks consume 1357 to 3338 kJ/tonne-km (depending on the class of truck). (Transport Canada 1991)

Forecasts for the period 1988 to 2010 indicate that a modal shift from truck to rail offers the most significant and realistic opportunity for saving energy and improving environmental quality for freight transport. (Transport Canada, 1991) Since "railroad operation exhibit economies of density, all other things being equal, as traffic volumes increase, unit costs go down. Thus a 10% increase in rail traffic volume would cause a 2% decrease in average transportation costs." (AAR 1989) If Government stopped subsidizing long-haul truck traffic, a modal shift to rail would result and GHG emissions would be reduced. (AAR 1989)

According to Canadian railways, due to the unequal share of taxes and subsidies between rail and road, an artificially induced shift of traffic towards road is occurring. (CP Rail 1993) Full-cost accounting aims at internalizing all external environmental costs and creating a "level field" in terms of subsidies and tax burdens across competing interests. This will ensure that less environmentally damaging modes of transportation are not at a competitive disadvantage in the marketplace vis-a-vis products which cause pollution and waste. This is evidenced in Sweden where changes in passenger transport usage due to the introduction of air pollution charges resulted in an 11% decrease in private car use and a 20% increase in public transport. (IRCA/UIC) Full-cost accounting must incorporate costs of safety effects, traffic emissions, congestion, noise, wear and tear, and land use. The rail mode's comparative advantage with respect to external costs is not recognized in the marketplace. The charge for GHG emissions may also encourage cleaner or more efficient technologies to be introduced. For example, when HC and NO_x charges were introduced, the domestic airline in Sweden replaced combustion chambers in their planes resulting in emissions decrease of 90% for HC and 15% for NO_x. (Hansson 1992)

Currently, Canada's two rail freight carriers, Canadian National (CN) and Canadian Pacific (CP) are required to pay property taxes on rail rights of way; VIA rail, Canada's national passenger rail line, is required to pay rent to CN and CP for use of their track. In 1991, CP paid \$64

TRANSPORTATION SECTOR MEASURES

million in property tax and CN paid \$82 million. As trucking companies are not required to pay equivalent property taxes on roads, the average annual property tax payment of roughly \$60 million represents an unfair tax to rail (or an unfair subsidy to trucking companies for road use). (CP Rail 1993)

Description of Actions

As part of the National Green Transportation Strategy, a federal-provincial agency should implement the following actions to encourage a modal shift towards more efficient forms of freight and passenger inter-city transportation in Canada. Intermodality, the combination of rail for long distance movement of bulk goods and road for short distance distribution of these same goods, appears to provide the most suitable option (ORTEE 1992).

I Remove subsidies and special taxes from road and rail

The subsidies and taxes for road and rail will be analyzed to allow road and rail (both passenger and freight) transportation to compete equally based on the true costs of their systems. The federal government would exempt rail from right-of-way property payments. Alternately, the federal and provincial governments could explore methods to levy a similar tax on road users, specifically the trucking industry, to level the playing field between road and rail.

II Implement full-cost road use charges

The implementation of road user charges that take into account environmental costs (e.g., GHG emissions), infrastructure costs, and so on, should be implemented through the use of tolls, fuel taxes, and appropriate weight limits for freight.

The implementation of road user charges, as part of full-cost accounting, could influence shippers to explore intermodal links in transportation in order to defer an increase in their costs. Infrastructure costs can be covered either directly by "tolls" or indirectly by explicit infrastructural user-charges or through fare revenues. Similarly, road passenger transportation will pay their share to maintain the road infrastructure and cover the environmental damage caused by automobile, truck and bus use. In determining road-use charges, costs may be biased to encourage environmentally cleaner modes. For example, given that bus passenger transportation is the most energy efficient mode and cleanest mode, it should pay lower charges than automobile use, and similarly for freight, trucks should pay an amount equivalent to cost of rail use.

5.22 REGULATE HIGHWAY SPEEDS

As part of the National Green Transportation Strategy, take a two step approach to reducing fuel consumption on highways; Enforce speed limits and Regulate provincial highway speeds at a national level of 80 kph.

MEASURES TO REDUCE GREENHOUSE GASES

Overview

Most vehicles in operation use fuel most efficiently when operating between 67 and 80 kilometres per hour. Speeds under or over the optimal speed result in increasingly inefficient use of fuel. For instance, a Plymouth Reliant uses roughly 2.2 kJ/m of energy when operating at 80 km/h. At 30 km/hr it uses roughly 3 kJ/m of energy and at 115 km/hr it uses roughly 2.4 kJ/m.

Description of Actions

I Enforce Highway Speed Limits

This action would entail a greater degree of enforcement of current speed limits, especially in high density corridors. Financing for this action could be drawn from funds collected through the implementation of road user charges and fines from those road users caught speeding.

II Reduce Highway Speed Limits

This action would require a change in regulations governing highway speeds and would need to be implemented under provincial jurisdiction. Highway speed limits could be reduced to 80 km per hour.

6. ENERGY SUPPLY AND PRODUCTION SECTOR MEASURES

6-1 ELECTRICITY SUPPLY AND DEMAND MEASURES

6.1 ELECTRIC UTILITY CLIMATE CHANGE CHALLENGE PROGRAM

Establish a voluntary Electric Utility Climate Challenge Program to implement GHG emission reduction measures. Individual companies would set targets, register them with governments and, in collaboration with utilities and other stakeholders, establish reporting systems. The Electric Utility Climate Challenge Program will be modelled on and use the same mechanisms as the National Voluntary Challenge Program.

Overview

Voluntary action offers the potential to achieve significant progress in meeting Canada's commitments under the Framework Convention on Climate Change, while simultaneously recognizing a wide range of public and emitter concerns. Governments already regulate emissions and have the legislative authority to regulate more. Voluntary action, while neither removing the requirement for emitters to meet existing regulations or precluding the possible implementation of additional requirements, may offer a quicker and more flexible approach to meeting environmental goals. It also has the potential of being less costly for both government and industry.

The Challenge Program would provide utilities with an opportunity to participate in an open and non-prescriptive decision-making process aimed at the achievement of cost-effective GHG emission reduction initiatives. It could alleviate the need for the imposition of economic instruments and/or mandatory regulations to the extent that emission targets are achieved on a voluntary basis. It could also provide an opportunity for utilities to enhance corporate image and gain public support for the specific action plans which are developed under the Challenge Program.

Participating utilities would have the flexibility of choosing from and implementing a portfolio of measures which make the most technical and economic sense given their circumstances. That portfolio could include any combination of (but would not necessarily be limited to) the measures which are presented below. Each utility would propose emission targets and schedules for achieving those targets.

MEASURES TO REDUCE GREENHOUSE GASES

The immediate goal of the Electric Utility Climate Change Challenge Program would be to develop a set of voluntary agreements which collectively would result in the reduction of GHG emissions from the Electricity Sector by the year 2000. A decision as to the capability of this measure to achieve further reductions for the year 2005 and beyond would be made on the basis of an assessment of utility buy-in to the concept within approximately two years.

The following actions would be undertaken in the context of the broader National Challenge Program and would be registered under the National Registry for Voluntary Action. (See Measures F1 and F2.)

Description of Actions

- Electric utilities will submit letters of intent to participate in the Electric Utility Climate Change Challenge Program to appropriate provincial and federal government agencies by a specified date.
- A generic Memorandum of Understanding (MOU) document will be developed by government in close consultation with the Canadian Electrical Association members.
- Electric utilities will exchange information on proposed programs with appropriate provincial and federal government agencies.
- These programs would include proposed targets and schedules, action plans, and reporting commitments.
- Individual Memoranda of Understanding (MOUs) or agreements will be developed between utilities and appropriate provincial and federal government agencies by a specified date. These MOUs or agreements would include implementation action plans and a strategy for reporting progress. Action Plans would include a selection of measures such as supply side efficiency improvements, demand side management, and others as appropriate.
- The NAICC, or a designated Task Group, will ensure that utility efforts to develop voluntary programs are coordinated with and recognized as a component of other measures where necessary, e.g., the National Challenge Program, the National Registry for Voluntary Action, Renewable Energy, etc. This would require the on-going input and support of a Secretariat provided by Environment Canada and Natural Resources Canada.
- The NAICC will review the projected effectiveness of the Electric Utility Challenge Program, the progress made in achieving national targets and schedules, and the need for further economic instruments and mandatory regulations, by a specified date.

6.2 INTEGRATED RESOURCE PLANNING (IRP)

The IRP measure presents two options because of differing views of stakeholders. The first option suggests IRP be adopted **voluntarily** as part of the Utility Challenge Program. The second option **requires** IRP to be mandated by provincial agencies. In either case, utilities will require the support of provincial governments or utility boards to create a regulatory climate conducive to true least-cost planning of all environmentally-appropriate service options.

Overview

The purpose of integrated resource planning (formerly called least cost planning) is to enable utilities to identify and provide the least cost mix of options to the utility system and its customers from among all the options which are now available, i.e., not only the traditional utility supply side options.

IRP is a process used by some electrical utilities and other energy agencies to develop plans that will best meet future needs, considering all available supply and demand options. Full cost accounting, incorporating social and environmental externalities, can be applied with this process. For electric utilities, IRP provides a consistent methodological framework to evaluate and incorporate demand side management (DSM), renewable energy options, non-utility generation, and other alternative options, along with conventional utility generation options, in future plans. Using IRP methodology, the measures that best meet GHG reduction objectives can be integrated into an optimized plan which considers a broad range of costs and benefits.

The important implication of this measure is that it establishes a framework for utilities to become true electricity service agencies, whereas their historical mandate has been to supply electricity at the lowest possible price. IRP offers the potential of placing the management of electricity demand on an equal footing with electricity supply.

An IRP option practised in some jurisdictions is the inclusion of the environmental costs associated with various options when assessing their relative cost-effectiveness. This requires assigning a dollar value to the environmental externalities so that they can be included in cost-benefit analyses.

Description of Actions

Option 1

- Electric utilities will consider the voluntarily implementation of IRP as one element of the Electric Utility Climate Change Challenge Program and will coordinate with provincial governments or utility regulatory boards, as necessary, to ensure that supporting regulations will be put in place.

MEASURES TO REDUCE GREENHOUSE GASES

- The adoption of IRP will be assessed by utilities for its GHG reduction potential beyond the base case. This will be submitted to the Utility Climate Challenge Program for registration.
- Natural Resources Canada, in collaboration with Environment Canada, will provide provincial government agencies and electric utilities with appropriate technical information and support concerning the mechanisms and potential benefits of IRP.
- Provincial governments will review the mandates of Crown utilities and, where appropriate, amend them to ensure that they are supportive of a shift towards IRP and DSM activities.
- Utility regulatory boards will allow profit making on energy efficiency investments made by private electric utilities by, for example, allowing the inclusion of such costs in the rate base and "decoupling" profits from sales volumes in order to remove existing disincentives.
- The CEA will coordinate the sharing of utility information on IRP methodology through the sponsorship of studies, national or regional IRP conferences, workshops and training. Financial and technical support for this initiative would be made available by Natural Resources Canada and Environment Canada.
- The CEA will facilitate a cooperative effort by utilities to develop and implement enhanced IRP methods and quantify environmental and socio-economic costs and benefits.
- Provincial governments will encourage utilities to voluntarily implement an IRP process for developing their supply and demand plans.

Option 2

- Provincial governments will require, as appropriate, that electric utilities, public and private, implement IRP as their planning and decision-making framework in meeting future needs.
- Provincial governments will review the mandates of Crown utilities and, where appropriate, amend them to ensure that they are supportive of a shift towards IRP and DSM activities.
- Utility Regulatory Boards will allow profit making on energy efficiency investments made by private electric utilities by, for example, allowing the inclusion of such costs in the rate base and "decoupling" profits from sales volumes in order to remove existing disincentives.

ENERGY SUPPLY AND PRODUCTION SECTOR MEASURES

- The adoption of IRP will be assessed by utilities for its GHG reduction potential beyond the base case. This will be submitted to the Utility Climate Challenge Program for registration.
- The CEA will coordinate the sharing of utility information on IRP methodology through the sponsorship of studies, national or regional IRP conferences, workshops and training. Financial and technical support for this initiative would be made available by Natural Resources Canada and Environment Canada.

6.3 SUPPLY SIDE EFFICIENCY IMPROVEMENTS

Electric utilities will accelerate the implementation of cost-effective supply side efficiency improvements. The accelerated program will be formally registered as part of the utility commitments under the Utility Climate Challenge Program.

Overview

Utility customers and the rate governing bodies to which they report have long demanded that utilities keep costs, and more importantly rates, under control. In responding to this need, utilities have historically pursued, and will no doubt continue to pursue, cost-effective efficiency opportunities in an effort to reduce operating costs.

Typical improvements in generation efficiency to date have included:

- Fine tuning of boilers and up-grading of boiler controls
- Upgrading of auxiliary motors
- Upgrading of hydraulic turbines
- Numerous rehabilitation programs at existing generating facilities
- Re-blading and upgrading of steam turbines
- Optimized operation of generation systems so as to enable the operation of individual generating units at or near full load (i.e., at the most efficient "set-point").

All of these efforts have resulted in, and will continue to offer, the potential for improved generation efficiency and an associated reduction in CO₂ emissions on an energy input basis. However, further opportunities may be realized by providing additional incentives for utilities to optimize their internal energy use. One means by which this may be accomplished is by internalizing the cost of utility energy consumption, an option which is being promoted by numerous government and non-government organizations and is now being seriously considered by some Canadian utilities. The fundamental objective of this cost-internalization approach is to place a "real book value" on internal energy consumption, and in so doing to establish a basis for utilities to identify/quantify potential efficiency improvement opportunities and targets.

MEASURES TO REDUCE GREENHOUSE GASES

Pricing may be based on the cost of production or on the cost of electricity sold to the grid, although the latter is generally more indicative of the real value of energy saved through supply side efficiency programs. The Canadian Industry Program for Energy Conservation (CIPEC) could facilitate the development of data on utilities' internal energy use.

There are also opportunities for efficiency improvements in the design and operation of utility transmission and distribution (T&D) systems. Potential options include:

- MVAR dispatching (the objective being to minimize line losses by maintaining a proper MVAR balance on the system)
- The use of higher operating voltages, particularly on transmission systems
- System voltage improvements via power factor correction
- Selecting conductor sizes to reduce long term costs
- The location of generating capacity near load centres to reduce transmission distances
- Efficiency enhancements to switching station auxiliaries
- The use of high efficiency power transformers.

The primary stimulus behind efforts to improve T&D system efficiencies is the line losses which occur in the transmission and distribution of electrical energy. These losses may be as low as 3% to 4% on relatively short transmission systems but are 10% in a typical Canadian utility and can be even higher for utilities which must operate very long transmission systems (e.g., Hydro Quebec).

When T&D system losses are reduced, less electricity is required to meet end use demands, and there is an associated reduction in CO₂ emissions from the fossil fuel-fired generating stations. Increasing the adoption of more efficient transmission and distribution equipment, and most notably the development and expanded use of high efficiency transformers, offers the potential to further enhance the benefits of the efficiency improvements noted above. It has been estimated that such improvements might result in a 5% to 10% reduction in T&D losses on specific projects (SaskPower, May, 1994).

Description of Actions

Lead Action

- Electric utilities, as part of their Utility Climate Challenge commitments and in collaboration with provincial governments, Natural Resources Canada and Environment Canada, will assess the GHG emission reduction potential associated with supply side efficiency improvements.

ENERGY SUPPLY AND PRODUCTION SECTOR MEASURES

Support Action

- Electric utilities will consider internalizing the cost of their energy use
- Electric utilities, in collaboration with the CEA and Natural Resources Canada, will promote the accelerated development of new efficiency standards for transformers by the Canadian Standards Association (CSA).
- Electric utilities, in collaboration with the CEA and Natural Resources Canada, will promote the use of high efficiency equipment such as transformers and institute early replacement of low efficiency on their systems where such replacement can be economically justified.
- Electric utilities will provide information on the potential environmental and cost advantages of high efficiency equipment such as transformers to their commercial and industrial customers.
- Environment Canada will investigate the feasibility of incorporating the use of high efficiency equipment such as amorphous core transformers into the "Environmental Choice Program".

6.4 EXTEND DEMAND SIDE MANAGEMENT (DSM) PROGRAMS

Electric utilities will investigate and implement cost effective DSM programs beyond those already planned. Utilities will register GHG reductions resulting from DSM programs implemented as part of their voluntary commitments to GHG reductions.

Overview

From a utility perspective, DSM is usually defined as "the planning and implementation of those utility activities designed to influence customer use of electricity in ways that will promote desired changes in the utility's load shape, i.e., changes in the time pattern and magnitude of a utility's load" (Haites, Demand-Side Management Achievements and Targets in Canada, September, 1993). In this context, the primary objective of DSM programs is to encourage customers to change the timing and magnitude of their demand for electricity.

MEASURES TO REDUCE GREENHOUSE GASES

Many Canadian electrical utilities have experience with different DSM programs. Examples include:

- Public education on the benefits of energy efficiency, including literature on energy efficient products, appliances and technologies;
- Rate incentives, such as interruptible rates and time-of-use rates;
- Financial incentives for the purchase of energy efficient products, such as low flow shower heads;
- Financial incentives, e.g., low interest loans for energy efficiency up-grades undertaken by customers, such as increased residential insulation;
- Incentives to switch specific loads from electricity to other energy sources, such as conversion of electric water heaters to natural gas;
- The provision of (free) technical advice and assistance to customers as to how to improve their energy efficiency.

Electrical utilities may also have programs which encourage levels of efficiency which are higher than minimum standards (e.g., the "R2000" home). Some programs promote load management measures to reduce power system peaks. This is generally done on the basis of least cost analysis where it can be shown that energy saved or load shifted to reduce marginal generation is more economical than new generation.

The energy efficient products, equipment, processes and appliances which are promoted by utilities are typically "proven". Utilities may also promote process optimization measures and electrotechnologies (e.g., the use of electric arc furnaces in smelters) that improve overall energy efficiency and reduce global GHG emissions although they may increase electricity consumption.

Comparing the targets and mix of DSM activity across Canadian utilities is difficult since each utility faces its own set of unique circumstances, with regard to generation mix, projected load growth (or decline) and surplus generation capacity on the system. Differences in the scale of DSM activity among utilities are generally more indicative of differences in circumstances as opposed to differences in the level of commitment to DSM. Comparisons with U.S. utilities are even more difficult because: a) many of the U.S. DSM targets have been mandated by regulatory authorities, and b) financial incentives are available to some U.S. utilities who meet or exceed DSM targets. These difficulties notwithstanding, there are emerging trends in the Canadian DSM scene.

ENERGY SUPPLY AND PRODUCTION SECTOR MEASURES

Canadian utilities have been offering their customers an increasing variety of DSM programs over the past five years. Buy-in to these programs has been steadily increasing. Capacity interruptible load and load shifting programs were most popular initially. However, there has been tremendous growth in energy efficiency improvement (EEI) programs. In fact, the dramatic expansion of EEI programs since 1989 is perhaps the most striking feature of DSM activity from a Canadian utility perspective. Starting from a small base, the impact of EEI increased by approximately 800% between 1989 and 1992. The share of the impact on load (i.e., offset GWh production) rose from 6% to 80% (Haites, September, 1993). The impact of EEI programs has grown faster in the residential sector than in the commercial sector. Load growth programs (those which strive to increase a utility's load factor) appear to have remained relatively constant in terms of their impact on both system peak and load, but with the rapid expansion of EEI programs, their relative importance to future DSM activity appears to be diminishing.

Expenditures on DSM programs grew from \$68 million in 1989 to \$574 million in 1992, an increase of approximately 750% (Haites, September, 1993). EEI programs accounted for 60% of total expenditures in 1992; this compares to a figure of 17% for load shifting programs.

Data collected by Haites indicates that Canadian utilities collectively plan a significant increase in their DSM activity over the balance of the decade and that the mix of programs will continue to shift toward EEI. By 2000, EEI programs are expected to account for almost half the impact on the total system peak while capacity interruptible load and load shifting programs are expected to account for about 20% each. More significantly, DSM impacts on load will be achieved primarily through EEI programs, the residential and commercial sectors each accounting for approximately 35% of the total energy savings and the industrial sector for about 30% of that total. The total impact on load is projected to increase from approximately 3500 GWh in 1990 to something in the order of 25,000 GWh in 2000 (Haites, September, 1993, Ontario Hydro, April, 1994). Nationally, the impact of DSM programs on forecast load is expected to rise from about 2.6% in 1995 to 6.0% in 2000 (Haites, September, 1993).

No definitive estimate of the GHG emission reductions associated with planned DSM activity has yet been developed. However, a qualitative analysis is possible based on the above-mentioned Haites data, Ontario Hydro's preliminary assessment of DSM-related GHG emissions reduction potential, and an assumption that all energy savings associated with DSM initiatives impact the operation of oil or coal-fired generating stations where they exist in a utility.

The potential energy saving associated with currently planned, Canada-wide DSM activity is in the order of 12,000 GWh in the year 2000, which means that GHG emissions from the electrical utility sector in 2000 are projected to be in the order of 12 Mt less than they would have been without DSM initiatives. This represents more than 2% of national GHG emissions.

MEASURES TO REDUCE GREENHOUSE GASES

This conclusion is based on the following assumptions:

- Assumption 1:** DSM activities planned by Hydro Quebec, Manitoba Hydro and BC Hydro have no impact on GHG emission reductions because they offset hydro (as opposed to fossil fuel-fired) generation.
- Assumption 2:** All energy savings associated with the DSM initiatives in all other Canadian utilities result in decreased fossil fuel-fired generation.
- Assumption 3:** For the purposes of this discussion, the CO₂ emissions from oil and coal-fired generation are assumed to be equivalent.
- Assumption 4:** A 1000 GWh energy saving is equivalent to a CO₂ reduction of approximately 1 Mt.
- Assumption 5:** The DSM energy savings projected in the Haites report for 2000 hold true.

Description of Actions

Lead Actions

- Utilities will strive to maximize cost effective DSM commitments.
- Commitments to DSM programs will be registered as part of the Utility Climate Challenge Program along with GHG reduction estimates.

Support Actions

- Electric utilities will assess potential opportunities to provide further information and training to their residential, commercial and industrial customers concerning the benefits of EEI.
- The CEA will evaluate its current R&D commitment to EEI with a view towards actively pursuing the accelerated commercialization of promising energy efficient appliances and equipment.
- The CEA, in collaboration with provincial governments, regulators and Natural Resources Canada, will coordinate an assessment of the possibility of electric utilities promoting EEI in collaboration with oil and gas suppliers. The objective of this initiative would be to address what consumers often perceive to be a confusing array of energy promotions.

6.5 ELECTRICITY AND HEAT COGENERATION OPPORTUNITIES

As part of the Electric Utility Voluntary Challenge Program, cost-effective opportunities to increase thermal efficiency and reduce emissions using electricity and heat cogeneration will be reviewed. Based on the review, targets and schedules will be established to increase cost-effective combined heat and power opportunities in Canada.

Overview

All steam electric generating stations, including nuclear facilities, have the technical capability to cogenerate heat with electricity. This combined heat and power (CHP) approach to energy production offers the potential to increase thermal efficiency from about 35% (i.e., for conventional simple cycle generation technology) to over 80% by harnessing a significant portion of the heat that would normally be wasted in flue gases and cooling water. From a GHG perspective, this improvement in efficiency represents a potential opportunity to reduce CO₂ emissions from individual generation facilities by more than 50% on an energy output basis.

In a Canadian context, combined cycle plants which use natural gas and steam turbines with cogeneration of heat are generally viewed as having the highest thermal efficiencies. However, in a European (and to a smaller degree, U.S.) context, steam electric generating stations with cogenerating district heating systems routinely achieve cycle efficiencies of 85%.

Some Canadian utilities are involved in cogeneration projects. For example, Ontario Hydro is using waste heat at its Pickering Generating Station, and New Brunswick Power both have units which provide steam to nearby industrial plants. NS Power is currently investigating the potential for a community energy system supplied from their Tufts Cove Station to serve the Halifax metro area. However, most Canadian utilities have not been actively involved in CHP, at least until very recently, because of the difficulty in incorporating potential CHP opportunities into the long-term planning of generating capacity and because of the legal obligation to provide the most reliable and economic service to their customers. In other words, the traditional mandates of most Canadian utilities have not encouraged or authorized them to do so. The apparent shift toward Integrated Resource Planning, for example, as outlined in Ontario Hydro's "Strategy for Sustainable Energy Development", appears to be alleviating this problem.

Non-utility industrial generators (e.g., pulp and paper mills) are generally in a better position to utilize waste heat than the major electric power utilities because: a) they have consistent process requirements for low grade heat; b) they can use that heat on-site; and c) as a result of b), they do not have to be concerned about the development of the supply infrastructure which is required to provide low-grade heat, in the form of steam or hot water, to off-site customers. Non-industrial co-generation units, which are relatively small, simple and fast to build when compared to traditional utility generating units, are becoming increasingly common throughout Europe and North America. They are usually owned by non-utility generators (NUGs).

MEASURES TO REDUCE GREENHOUSE GASES

Canadian installed cogeneration capacity and production are not reported in available references (NRC, 1992 and 1993), but were believed to be in the order of 2000 MW for 1990. The reported "attainable" new non-utility generating capacity and production for co-generation for the year 2000 are reported to be 2367 MW and 17,226 GWh respectively. This represents about 2.3% and 3.7% of the total estimated national 1990 capacity and electricity production respectively.

Description of Actions

Lead Actions

- Electric utilities will assess potential feasible cogeneration projects to the year 2005, as part of their planning function
- Commitments of additional cogeneration capacity will be reported and registered as part of the Utility Climate Challenge Program.

Support Actions

- Natural Resources Canada will undertake an assessment of (new) cogeneration potential in government-owned facilities and to provide the results of that assessment to the NAICC, the CEA, non-utility generators, and other interested stakeholders on as-requested basis.
- Natural Resources Canada will provide appropriate technical information and support to appropriate provincial agencies concerning the potential benefits of combined heat and power facilities.
- Provinces will require an evaluation of potential CHP opportunities as part of the environmental assessment process associated with all future thermal electric power generation projects.
- Electric utilities, in collaboration with Natural Resources Canada and Environment Canada, will identify potential cogeneration technologies which require demonstration support.
- Natural Resources Canada will evaluate the feasibility of developing year 2000 district heating and cooling plans for Canadian communities with economic potential for integrated energy systems. If it is feasible, it will provide appropriate feedback to the electric utilities, non-utility generators, municipalities and other concerned stakeholders.

6.6 INVESTIGATE GENERATION FUEL SWITCHING

As part of the Electric Utility Voluntary Challenge Program cost effective opportunities should be investigated to undertake coal-to-gas fuel substitution as well as other generation fuel switching opportunities which reduce GHG emissions. The investigation will take into account the environmental impacts of the full fuel cycle. Implementation targets and schedules will be established for utilities as part of the Challenge Program.

Overview

It is estimated that 76% of the total 1990 GHG emission from electric utilities was associated with the operation of coal-fired generating stations (EMR, 1991). Approximately 45% of this total came from Alberta, 34% from Ontario, and 11% from Saskatchewan. The remaining 10% came primarily from Nova Scotia (7%) and New Brunswick (2%).

The relatively low GHG emission factor for natural gas as compared to coal is well documented; at-source GHG emissions are approximately 40% less from a gas-fired unit than from a coal-fired unit on an energy input basis. However, it is important to note that a true comparison of the potential GHG benefits of gas over coal must take into account the emissions associated with the other phases of the full fuel cycle, i.e., such activities as fuel gathering, processing and transport. Existing data on full fuel cycle CO₂ emissions from the electric utility sector are highly variable. For example, Ontario Hydro reported a range of 6.6×10^5 to 1.5×10^6 Mg/TWh for natural gas. (This compares to a range of 9.3×10^5 to 1.1×10^6 for coal.) A database which is currently being developed by the province of Alberta should help to narrow this variability and will be available in the fall of 1994.

Preliminary studies have examined at the potential of replacing coal with gas in Alberta. These studies evaluated the feasibility of both complete conversion and of retrofitting gas reburning technology. The latter retains coal-firing capability but has the technical potential to reduce GHG emissions from existing units by up to 20%. It may also be possible to integrate gas into coal-fired plants by "repowering" the existing boilers with large combustion turbines. For example, a 100 MW gas turbine placed in front of a 400 MW boiler could result in a 15% to 20% improvement in unit heat rate and associated reductions in CO₂ emissions.

The above-noted studies should be expanded to include the provinces of Saskatchewan and Ontario. They should take into account factors such as the future availability of natural gas, potential supply limitations associated with the capacity of the existing pipeline network, and the long term cost-benefit of using this high value fuel in an application with an overall efficiency of something less than 30% (taking line losses into account).

MEASURES TO REDUCE GREENHOUSE GASES

Description of Actions

Lead Actions

- Electric utilities will evaluate the technical and economic feasibility of converting existing oil or coal-fired boilers to lower carbon fuels on the basis of their reductions in GHG emissions.
- If it is selected as an action, targets and schedules for conversion will be established by the utilities indicating anticipated GHG reduction potential as part of the Utility Climate Challenge Program.
- Registering, evaluation and monitoring of implementation actions will be undertaken by the NAICC.

Support Actions

- Electric utilities, in collaboration with the Provinces, Environment Canada, Natural Resources Canada, and the CGA, will coordinate the development of a consensus opinion on the full fuel cycle emission of CO₂ associated with firing of natural gas in utility boilers.
- Natural Resources Canada, in collaboration with electric utilities, the CGA, and Environment Canada will develop a consensus opinion as to the long-term sustainability of firing natural gas in utility boilers, as an integral component of the Canadian Climate Change Action Plan.
- Natural Resources Canada, in collaboration with the CGA and electric utilities, will determine to what extent, if any, existing pipeline delivery capacity would limit the technical feasibility of this measure.
- Natural Resources Canada, in collaboration with electric utilities and the CGA, will develop a report on the potential impact of increased utility use of natural gas on future market price.

6.7 EVALUATE INCREASED AVAILABILITY OF EXISTING HYDRO AND/OR NUCLEAR GENERATION CAPACITY

Electric utilities will evaluate the technical and economic feasibility of increasing the potential availability of existing hydro and/or nuclear generating stations. They will provide a report on feasibility and GHG reduction potential to the NAICC.

Overview

There are 22 operational nuclear generating units in five locations in Canada. Most of the installed capacity is owned and operated by Ontario Hydro, which has a total of 20 units with a combined generation of 14,000 MW. New Brunswick Power and Hydro Quebec each have a single unit, the capacities of which are 635 MW and 638 MW respectively.

While existing nuclear generating stations offset GHG emissions from fossil fuelled stations, their ability to contribute to a national strategy to effect further GHG reductions is very much dependent upon their long term reliability, that is, their projected capacity factor in the future. For example, a 700 MW nuclear generating unit (roughly the average size in Canada) with an operating capacity factor of 80% represents a CO₂ offset of about 5 Mt, assuming that the required replacement energy comes from coal-fired generation. This offset would drop by 50%, to about 2.5 Mt, if that unit's capacity factor were to drop to 40% as a result of availability problems.

The availability of existing Canadian nuclear units has varied considerably over time. For example, Ontario Hydro's Pickering "A" Station has encountered problems with the reactor fuel pressure tube channels; Unit 2 at the Bruce "A" station has experienced problems with the steam generator tubes. Current plans are to remove Unit 2 at Bruce "A" from service in 1995 until such time as the demand for base load operation increases to the point where the economics of the major capital investment which would be required for rehabilitation can be justified (Talbot, March, 1994). Such considerations will tie into the Integrated Resource Planning measure described earlier. (See Measure 6.2)

Description of Actions

- Electric utilities will undertake evaluations of hydraulic turbine upgrades for existing plant.
- Electric utilities will assemble projected capacity factors for all existing Canadian nuclear generating units for the period 1995 to 2020. In collaboration with the Atomic Energy Control Board, utilities will undertake an evaluation of the technical and economic feasibility of increasing the projected capacity factors for existing nuclear units. This evaluation will be undertaken on a full cost accounting basis.
- Utilities will register costs and GHG reduction potential for commitments to increased nuclear or hydro capacity as part of the Utility Climate Challenge Program.
- Registering, evaluation and monitoring of impacts will be carried out by NAICC.

6.8 INCREASED NON-UTILITY GENERATION (NUG)

Utilities in cooperation with provincial governments and utility regulatory boards, as appropriate, will make commitments to increased NUG purchases beyond planned commitments to 2005 to the extent that these contribute to GHG reductions. Additional commitments will be registered with the Utility Climate Challenge Program.

Overview

Alta reductions are possible if NUG can "back out" of existing or planned utility generation having a higher carbon emission co-efficient.

Description of Actions

- Utilities will report projected NUG purchases to the year 2005 to the Utility Climate Challenge Program.
- In a multistakeholder forum, utilities will investigate the further acceptance of environmentally-sound NUG as part of their systems.
- Provincial regulators will respond to this review with appropriate legislative adaptation.
- Utilities will set targets and schedules for increased NUG purchase as part of their voluntary commitments to the Utility Climate Challenge Program.
- The National Climate Challenge Program will be responsible for evaluating and monitoring utility commitments.

6.9 ASSESS NEW LOW EMISSION GENERATION CAPACITY

Assess future needs, timing and relative impacts for new large scale natural gas, hydraulic and nuclear generation facilities in Canada.

ENERGY SUPPLY AND PRODUCTION SECTOR MEASURES

Background

Most electricity forecasts indicate that there is sufficient large scale generating capacity in Canada for the next decade. This is due to extensive construction of major new facilities in the last two decades, and less than predicted growth in electricity demand.

Description of Actions

Utilities will assess the feasibility, including costs and environmental benefits, of meeting new capacity requirements through the provision of low emitting generation options such as natural gas, hydraulic and nuclear. Wheeling of power from these sources in neighbouring utilities will also be considered.

Although the terms of registering these actions are still to be worked out in principle, to the extent that these sources replace higher GHG emission generation, the difference in emissions will be available for registration with the Challenge Program.

6-II OIL AND GAS SUPPLY AND DEMAND MEASURES

6.10 CARBON DIOXIDE REDUCTION: UPSTREAM OIL AND GAS ENERGY EFFICIENCY IMPROVEMENT OPPORTUNITIES

Establish a voluntary Challenge Program to implement emission reduction measures. Individual companies will set targets with provincial and federal governments, and in cooperation with industry associations, establish the reporting systems.

Overview

CO₂ emissions for the upstream oil and gas sector are over 46 megatonnes per year. They are forecast to rise by 34% by the year 2005. (RTM, 1991) This measure focuses on reduction of CO₂ emissions by means of increased energy efficiency.

This sector includes exploration, drilling, production, processing, transportation and oil sands operations. A broad range of facilities and potential initiatives could affect CO₂ emissions from oil and gas operations. They are mainly due to the combustion of various gases in fields and at plants and to the combustion of coal and natural gas for electrical generation.

The technical emissions reduction potential for this sector (excluding oil sands) has been identified to be somewhere between 6.5% (3.0 megatonnes) (Canadian Petroleum Association) and 31% (14.3 megatonnes) (Alta Department of Energy). The capital cost to achieve a 6.5% reduction has been estimated by an industry sponsored report at \$54 million 1991. Detailed cost assessments of the more optimistic case have not been accepted by the industry.

Description of Actions

Existing voluntary programs such as Canadian Industry Program on Energy Conservation (CIPEC) should be expanded to implement energy conservation. An energy efficiency and CO₂ emission/utilization reporting system should be developed in conjunction with provincial oil and gas organizations. It would be an extension of existing reporting systems. This would help establish an industry wide energy consciousness which would trickle down to the corporate level.

The principles of the National Climate Challenge Program will be expanded to the oil and gas production and distribution sector. An Oil and Gas Challenge Program will be developed. It will establish targets and reporting systems with the industry.

A voluntary program built around an industry-wide reporting system would allow the industry to pursue energy efficiency measures in the most cost-effective manner. Energy efficiency measures require a number of technical changes at the local level and relies on ongoing

ENERGY SUPPLY AND PRODUCTION SECTOR MEASURES

operation and maintenance. They are also cost-effective in their own right. A voluntary program seems appropriate as cooperation of each company is required.

The program could work in the following manner: Western Canadian provincial governments in consultation with CAPP, representing industry, would set a reduction target. The target would be based on a national plan for CO₂ reduction. Responsibility for ensuring the target is met would rest with government. Reporting systems are already in place within existing provincial agencies. These oil and gas reporting systems could be extended to include necessary energy and CO₂ data. This would reduce costs, ensure companies comply, and increase public confidence. The data could then be compiled for companies, industry sectors, provincially and for the industry as a whole. A joint annual report published by the appropriate provincial government agencies with assistance from CAPP would show the progress made by the industry.

The initial impact would be an increased awareness of where CO₂ is produced and the potential for reduction. This could build on the work done by CAPP over the past three years. At the company level, the workshop and backup materials entitled "Energy Management to Reduce Operating Costs" should be promoted. The report "CO₂ Reduction through Energy Conservation", and some of the initiatives in process at NOVA and other companies provide the information necessary to accomplish a 6% to 7% emission reduction. A 6.5% reduction represents 3.0 megatonnes of CO₂. Further research or demonstrations are required to identify savings from efficient in-situ bitumen production, efficient control and design of gas dehydration, innovative approaches to flared gas utilization for electricity, optimization of compressor discharge pressures, and use of advanced electric technologies.

6.11 METHANE REDUCTION: UPSTREAM OIL AND GAS INDUSTRY IMPROVEMENT OPPORTUNITIES

Establish a voluntary Challenge Program in conjunction with Measure 6.10 to implement methane emission reduction measures. Individual companies will set targets with provincial and federal governments, and in cooperation with industry associations. Individual companies, governments and industry associations will establish the reporting systems.

Overview

According to Canada's 1990 Greenhouse Gas Emissions Estimate, the upstream oil and gas industry emitted more than 1100 kt of methane into the atmosphere (SENES study estimates 1088 kt). This represents 29.4% of Canada's total anthropogenic methane emissions. Upstream oil and gas industry methane emissions come mainly from Alberta (76.2%), with the remainder coming from Saskatchewan (15.5%), B.C. (3.0%), Ontario (2.3%), the territories (1.3%), Manitoba (1.2%) and Quebec (0.6%).

MEASURES TO REDUCE GREENHOUSE GASES

According to the SENES study, methane emissions from the upstream oil and gas industry are forecast to reach 1240 Mt in 2000 and 1230 Mt in 2005.

According to CAPP inventory, in 1989, the upstream oil and gas industry in Alberta emitted 785 kt of CH₄ or 21 % of Canada's 3736 kt (1990) of CH₄ emitted. Emission sources can be broken down as follows:

	kt	Percent
Gas Production	297	37.9
Heavy Oil Production	199	25.4
Conventional Oil Production	88	11.2
Gas Processing	71	9.1
Accidents and Equipment Failures	64	8.2
Product Transmission	38	4.8
Crude Bitumen Production	19	2.4
Drilling	5	.6
Well Servicing and Testing	4	.5

The sources of total hydrocarbon (THC) emissions are:

Sources of THC Emissions	Percent
Equipment leaks	36.7
Process vents	27.0
Storage tanks	23.6
Combustion equipment	6.5
Accidents and equipment failures	6.2

The number of sources of total hydrocarbon emissions is extremely large. When considering all the potential sources of leaks and the equipment and machinery involved in the upstream oil and gas industry, the total number of points which could be targeted could be in the millions.

ENERGY SUPPLY AND PRODUCTION SECTOR MEASURES

Description of Actions

This measure involves the **voluntary** implementation of options to reduce methane contained in the CAPP resource document entitled "Technical and Cost Evaluation: Options for reducing methane and VOC emissions from upstream oil and gas emissions". While this measure is intended to be implemented voluntarily by the upstream oil and gas industry, provincial regulatory boards, such as the Alberta Energy and Utilities Board, could regulate the adoption of certain measures, where agreed to be cost-effective.

In its study, CAPP identified several areas where further work is required. For example, it is recognized that the values provided in the study should only be interpreted as guidance for establishing the control strategies that may apply for a given location. Actual values can only be established through testing after the appropriate control strategy is implemented. Also, some of the control options addressed apply to sources with relatively large amounts of emissions and may require considerable front end effort to justify their application. Other processes will not be economically attractive for smaller operations.

The CAPP study recognizes there is a need for companies to establish formal emission management programs to help them identify specific emission reduction opportunities and respond to these in an efficient and cost-effective manner. Careful monitoring of environmental performance and the sharing of this information between the different segments of a company will help it become more conscious of its environmental liabilities and weaknesses.

The CAPP study recommends that:

- Operator input must be incorporated in the selection of a particular control strategy for a plant or equipment;
- Further work should be undertaken to develop more accurate cost data for most of the control strategies presented in the report;
- Government and industry should sponsor seminars and workshops to promote the concept of emissions management and to help disseminate the available information;
- Case studies should be conducted to better demonstrate the potential and cost to reduce emissions at different types of facilities; and
- Government and industry should help demonstrate some of the more promising new technologies that are emerging.

It is likely that industry support for this measure will be dependent upon the establishment of a registry for voluntary actions.

This measure is primarily aimed at improving the efficiency of the upstream oil and gas industry. While measures identified in the CAPP document are generally intended to be cost-effective, each should be evaluated on a case-by-case basis.

6.12 METHANE REDUCTION: DOWNSTREAM GAS DISTRIBUTION SECTOR OPPORTUNITIES

Establish a voluntary Challenge Program, with CEPA and CGA, to implement methane emission reduction measures. Individual companies will set targets. Provincial and federal governments, in cooperation with industry associations, will establish the reporting systems.

Overview

Natural gas is produced mainly in western Canada and is transported to the rest of the country by high pressure transmission pipelines. High pressure natural gas enters local distribution systems at "gate stations" where its pressure is reduced so that it can be distributed to end-use customers.

Preliminary estimates from Gas Technology Canada (GTC) indicate that 1990 methane releases from Canadian natural gas distribution system may have been as high as 159 kilotonnes (kt) of methane. The comparable figures for the transmission and production sectors were 67 and 670 kt respectively. These figures are preliminary but generally consistent with initial U.S. results. Estimates for 2000 and 2005 are not yet available from GTC.

Since pipeline quality natural gas is approximately 95% methane, natural gas leaks from distribution systems are mainly methane emissions. Natural gas leaks from distribution systems fall into three main categories:

- Leaks from normal operations. Distribution systems incorporate a variety of fittings and valves where small natural gas leaks can occur.
- Releases during routine maintenance. When a valve or section of pipe is replaced, gas supply to the affected portion of the system is shut off but some of the gas already in that portion of the system may be released to the atmosphere (purging).
- Releases during system upsets and accidents. A disruption of the distribution system, such as the rupture of a pipe, enables gas to escape to the atmosphere until the gas supply to the damaged segment is shut off. Such incidents however, are very rare.

Gas Technology Canada (GTC) and the U.S. Gas Research Institute and EPA, are continuing studies to refine estimates of methane emissions associate with all sectors of the natural gas industry. Specific recommendations will await completion of these studies.

Natural gas distribution companies have an economic incentive to minimize natural gas leaks. They must pay for all the gas that enters their system but they are only paid for the gas that they deliver to customers. Therefore, gas that leaks from the system has a cost and earns no revenue. Canadian Gas Association member companies are actively investigating methods to reduce natural gas leaks.

ENERGY SUPPLY AND PRODUCTION SECTOR MEASURES

Further study is required to identify costs associated with controlling specific sources of fugitive methane emissions in the natural gas distribution sector. There is a continuing effort to reduce emissions through new technology and new maintenance and operating procedures. Estimates of emissions associated with natural gas distribution have been identified in Canada, the U.S., and around the world. Canadian figures appear to be comparable to those elsewhere.

Description of Actions

- With the assistance of GTC, gas distribution utilities, will report to provincial governments and NAICC on inventories of gas leakage quantities and sources and projects to 2005.
- Also the assistance of GTC, gas distribution utilities, will establish, with the provincial government and NAICC, reduction targets and schedules to 2005 as part of their commitment to the National Climate Challenge Program.

Further action with respect to possible measures should include the following:

- Complete studies detailing emission estimates for the distribution sector
- Reach conclusion as to the major sources of methane
- Determine costs of control options
- Determine if the industry can voluntarily control methane releases from these sources
- If releases cannot be controlled voluntarily, discuss with industry how government can regulate through standards or requirements.

6.13 INTEGRATED RESOURCE PLANNING (IRP) FOR GAS DISTRIBUTION UTILITIES

Provincial governments will require that natural gas distribution utilities implement IRP as their planning and decision making framework.

Overview

Integrated Resource Planning (IRP) is a tool developed initially for use by electric utilities over 10 years ago. It is increasingly being applied to natural gas utilities in the 1990s.

The purpose of IRP (formerly called least-cost planning), is to enable utilities to identify and provide the least-costly mix of supply and demand-side options to the utility system and its customers. For gas utilities, significant demand side management is not a familiar or traditional activity, and has been seen by some utility regulatory commissions in the past as inappropriate. Gas IRP has recently begun in Ontario and British Columbia.

MEASURES TO REDUCE GREENHOUSE GASES

The regulated rate structure of most private utilities means there is an inherent disincentive for considering efficiency measures on an equivalent basis to increased gas sales, thereby undermining the intent of IRP. For example, profit is allowed only on incremental sales margins, and rates are set on the basis of forecast sales with penalties often applying for undershooting forecasts.

IRP can include environmental costs (see below). When this occurs, it provides a framework for analyzing which markets it makes financial and environmental sense to engage in fuel-switching activities.

This measure will assist utilities to allocate resources for growth in the most cost-effective way considering both supply-expansion and demand management options.

Description of Actions

By whatever means is appropriate in each province, governments will ensure that gas utilities adopt IRP as their framework for planning. In most provinces this would likely take the form of changes to the way in which the gas utilities are regulated by utility regulatory boards or commissions, in consultation with the utilities and relevant stakeholders.¹

Currently regulated profit structures mean that private utilities are financially penalized for implementing IRP, and especially DSM. In order to financially reward utilities for developing DSM programs in an IRP framework, the following actions can be taken:

- Allow profit-making on energy efficiency investments by inclusion in rate base. Without this, utilities can make money by expanding supply, but not by selling energy efficiency products and services;
- In the initial years at least, offer bonus profits ("shareholder incentives") for proven success in accomplishing energy efficiency objectives;
- Since private utilities' profits are tied to their sales volumes, a disincentive exists to overshooting forecast energy efficiency targets. Profits can be "decoupled" from sales volumes in order to remove this disincentive.

¹It is assumed here that gas distribution utilities are private companies, and are regulated by utility commissions. Public gas utilities may need to be enabled to engage in IRP and DSM by amendments to the legislated mandate for the Crown Corporation.

ENERGY SUPPLY AND PRODUCTION SECTOR MEASURES

Additional elements of IRP which are usually included are as follows:

- The environmental "externality" costs of the supply side and demand side options are included when seeking the least cost options through doing cost-effectiveness analyses. This requires "monetizing" the environmental costs so that they can be included in the various cost-benefit tests;
- IRP usually involves an increased commitment to, and process of consulting with a utility's stakeholders, in order to obtain feedback on the whole planning process, and to help make decisions on many matters, such as trade-offs between accepting short-term rate increases in order to obtain a resource which is the lowest cost option in the long run;

Finally, the Canadian Gas Association and Natural Resources Canada will step up their research, education and promotion activities on the benefits of gas DSM and of IRP techniques.

6-III RENEWABLE ENERGY SUPPLY MEASURES

6.14 DEVELOP SUPPORTING GOVERNMENT POLICIES

Institute integrated and coordinated federal and provincial policy actions to achieve an increase in the supply of energy from renewable sources by the year 2005. Renewable energy targets distributed on a provincial basis will be made part of the National Challenge Program.

Overview

Governments, both federal and provincial, can influence the expansion of renewable energy by developing clear policy statements and strong commitments, and by initiating actions to provide a level playing field for energy prices.

Description of Actions

- i) Renewables require a clear policy statement from governments indicating the priority this energy source is to receive and providing a strong message for the industry, utilities, and all stakeholders. Quantifiable targets will be set linking these where possible to objectives for GHG reduction. Targets should be set in consultation with industry and users on technology by technology basis. Emphasis will be given by both levels of government indicating a resolve to initiate actions to undertake tax and regulatory reform and to undertake procurement policies in line with targets.
- ii) Governments will move toward a level playing field for all energy pricing at both provincial and federal levels. They will study and disclose subsidy and tax structures that exist in the energy sector on an on-going year-by-year basis. Incentives should be considered as direct (e.g. grants) and indirect (e.g. investment tax treatment). This action reinforces Measure F.5 which addresses a complete review and realignment of subsidies. On the basis of these reports, develop ways to correct biases against renewables by for example, neutralizing biased tax policies or instructing regulatory agencies to minimize inequalities. Integrate externality policies into costing and selection policies of renewables and conventional sources. It will be important in carrying out this review to incorporate fairness principles which seek to place renewables on an equivalent basis with fossil fuels considering all environmental externalities.
- iii) A Working Group to Examine Externalities will be established. Federal leadership will be shown by the NEB in arbitrating the value of externalities in the energy sector. All major stakeholders, energy producers and suppliers should be involved. Provincial studies will be initiated in parallel but every attempt should be made to coordinate results

nationally identifying where regional differences exist. The role of the Working Group will go beyond the study stage to a recommendation of how quantified and monetized externalities should be incorporated in energy price and tax structures.

- iv) Encourage and facilitate the use of renewable energy in remote locations to eliminate or reduce GHG emitting generation sources.

6.15 STIMULATE RENEWABLE ENERGY MARKETS

CANMET will coordinate with provincial counterparts to provide funding support for field trials (large scale demonstration) of emerging renewable energy technologies. This will improve their reliability, efficiency and competitiveness in the Canadian and international markets, and thereby accelerate their adoption by clients such as Canadian electrical utilities, private power producers, and foreign buyers.

Overview

A significant barrier to domestic and international market development of renewables is the lack of demonstrations. Demonstrations would help by proving performance and technical design/manufacturer capabilities, and performance data.

Description of Actions

The program will include the following actions:

- Extend current efforts, which now focus primarily on R&D, to enhance Canada's energy science and technology base and will target pilot and full-scale engineering development, demonstration and market diffusion. At the same time, business opportunities will be provided for Canadian companies.
- Serve to acquire and adapt foreign technologies to strengthen the competitiveness of the Canadian renewable energy industry, both in Canada and abroad. It will promote strategic procurement within governments and utilities. It will work within agencies to identify and rectify barriers to equitable procurement policies for renewables based on economic and technological criteria.
- Encourage the adoption of long-term financing mechanisms for renewables in addressing the barrier of relatively high up-front costs.

MEASURES TO REDUCE GREENHOUSE GASES

- Support a "Team Canada" approach to assist industry to access target markets (the U.S., the Caribbean, Europe, Central and South America, Africa and the Pacific Rim), where Canadian expertise and technologies (e.g., Solarwall, Ensyn fast pyrolysis process, advanced control systems for small hydro plants, and wind water-pumpers) are already recognized.
- Encourage renewable energy companies, which for the most part are small and medium size enterprises (SMEs), to make alliances with larger firms which have technology commercialization and international marketing capabilities in order to accelerate the development and marketing of their products.
- Participate in the development of technical standards to help remove trade barriers to Canadian technologies in both Canadian and the international markets.

6.16 DEVELOP RENEWABLE ENERGY INFRASTRUCTURE

Develop and implement training and certification programs for the renewable energy industry. Develop new safety and performance standards for renewable energy equipment and installations and adopt these into provincial building and electrical codes. Provide training on renewable energy systems to builders, electricians and building and electrical inspectors. Provide information to the general public on the benefits costs and opportunities of renewable energy.

Overview

A renewable energy infrastructure is a prerequisite to developing an informed, committed market. An established infrastructure also inspires consumer confidence and provides technology, installation, and servicing.

Description of Actions

Codes and standards are required that provide quality assurance for consumer protection and that help to build market confidence. Setting of these will be done working closely with all jurisdictions and for the range of technologies. Harmonization across provinces is required. Standards are required that reflect the state of current technology.

Broad education is required to inform a public about government policy and renewable energy options. Specific technical education will be coordinated for engineers, architects, purchasing agents and other skilled personnel to provide the training necessary for a manufacturing, servicing and market base development. Industry associations, Community Colleges, Universities and retraining programs are delivery mechanisms for these programs.

6.17 ENCOURAGE UTILITY ADOPTION OF RENEWABLE ENERGY

Provincial governments will work closely with electric and gas utilities and the renewable energy industry to develop programs and policies which support the demonstration and commercialization of renewable energy.

Overview

Utilities are the most important link in the effort to deploy renewables more widely. They represent the increased potential for an important market, a source of financing and the provision of skilled human resources. Utilities, accustomed to a central distribution model of electricity and gas supply, require a special focus to consider small and decentralized renewables as a viable component of their system.

Description of Actions

Provincial governments will consult with utilities and the renewable industry to develop policies which support the removal of identified barriers and the broader market penetration of renewables. The following are suggested actions which governments will enact through legislation or encourage through information, demonstration, fiscal measures, and as part of the National Climate Challenge Program.

- Allow innovative billing to reduce the overhead of administration e.g. provide wheeling of renewable energy from the customer's generator to their place of business, and permit demand meters to go backward for small renewable projects that occasionally have surplus;
- Require a specific capacity of electricity to be generated by renewables as set-asides or provide project support either through direct government subsidy or through a special "green" power rate;
- Guarantee a general price to renewable energy producers. The price could be based on long-term avoided cost over the life of the contract and should include consideration of environmental externalities. Another option is to provide support above market rates which considers the needs of each renewable project;
- Develop policy positions on externalities that include a comparison with renewables;
- Enhance the market for renewables through communication with and education of the financial community, utility planners, regulators, consumers and developer of renewables;

MEASURES TO REDUCE GREENHOUSE GASES

- Facilitate investment by utilities and others in companies providing renewable technologies;
- Provide financial assistance to customers where it is economic to do so;
- Set buyback rates of renewables considering environmental externalities;
- Set quotas and deadlines for renewable energy production;
- Set premiums for electricity from non-GHG emitting sources (recognizing value added), the cost can be offset by a surcharge on GHG sources.
- Develop a program similar to that in the U.K. (Non Fossil Fuel Offer) that requires renewable energy set-asides.

6.18 REVITALIZE R&D TO ACCELERATE THE DEVELOPMENT OF CANADIAN RENEWABLE ENERGY TECHNOLOGIES

By the year 2000, CANMET in cooperation with the provinces, will expand its renewable energy R&D commitments to levels comparable with fossil fuels' in 1990.

Overview

The Canadian renewable energy industry is small, fragmented and fragile made up mostly of small to medium-sized companies that rely on Government to support research. Federal and provincial R&D has declined in the last decade. R&D spending for both levels of government on renewables went from 13% of energy-related R&D in 1983 to 4% in 1991. This occurred while total energy R&D declined in real terms by 45% over the same period. Renewable energy markets are growing globally. To keep up and to begin developing long term sustainable energy supply options Canada must increase its R&D commitments.

Description of Actions

- Research will focus on bioenergy, active solar, hydraulic energy, wind, hydrogen, fuel cells, and electric vehicles;
- The program will build on existing research efforts in Canada and will encourage financial collaboration with industry, universities, utilities, research institutes and governments to leverage funding and to broaden the scientific base.

7. NON-ENERGY SECTOR MEASURES

7-1 INDUSTRIAL SOURCES AND SINKS

7.1 REDUCE EMISSIONS FROM WASTE LANDFILLS

Environment Canada, in collaboration with appropriate provincial governments, agencies and stakeholders, will coordinate the development and implementation of an Environmental Code of Practice for Solid Waste Landfill Gas Management. Operators of large and medium sized municipal landfills may respond by voluntarily installing landfill gas systems or by installation due to provincial regulations.

Overview

Based on currently available information, approximately 2.9% of Canada's 1990 total equivalent GHG emissions were released by municipal solid waste landfill sites. However, it is expected that this estimate will be revised downward, perhaps by as much as 40%, in the light of new information. For the purposes of this discussion, therefore, GHG emissions from waste landfills are estimated to contribute 1.7% to 2.9% of the Canadian total.

According to a recent survey, approximately 110 municipal landfill sites account for the waste generated by 60% of the Canadian population (Hickling, March 1994). A number of factors influence the rate of emission of GHGs from landfills, including: the volume, composition (particularly organic content) and moisture content of the deposited waste, the concentration of oxygen in the waste pile, the condition of the landfill liner and cover (if they exist at all), and climate. Although both CO₂ and methane are released from landfills, methane is more significant due primarily to the fact that its global warming potential (GWP) is roughly 10 times that of CO₂.

The impact of landfill GHG emissions can be significantly reduced by gas collection and combustion. The result is the conversion of methane to carbon dioxide and a subsequent decrease of over 90% in GWP emissions. This combustion can be undertaken in open or covered flares at the site. It may also be possible to harness the energy to provide heat and/or electricity if suitable facilities are close to the site. For example, heat could be provided to an industrial facility such as a cement kiln, or it may be viable to generate electricity at the site using gas turbines or reciprocating engines. It may also be possible to use the energy to supplement the fuel in an existing fossil fuel-fired steam electric generating station.

The diversion and recovery of organics from landfills could result in a significant decrease in the volume of methane which is associated with their decomposition.

MEASURES TO REDUCE GREENHOUSE GASES

Description of Actions

Option 1

- The Canadian Council of Ministers of the Environment (CCME), in collaboration with the NAICC should establish a national reduction target for landfill GHG emissions by a date to be decided.
- Environment Canada, in collaboration with Natural Resources Canada, the Canadian Electrical Association (CEA) and other stakeholders, should undertake a qualitative assessment of the realistic technical and economic potential of using landfill gas to generate electricity and effect a reduction in the current utility use of fossil fuel(s).
- Environment Canada, in collaboration with appropriate provincial government agencies and other stakeholders, should coordinate the development of an Environmental Code of Practice for Solid Waste Landfill Gas Management. This Code would identify and share best engineering and operating practices and identify the economic implications of its implementation on the basis of typical case studies.
- Provincial environmental agencies should establish regulations requiring the installation of gas recovery systems for new and existing large and medium size landfills, if these systems are not already installed or planned for.
- Electric utilities or provincial energy regulatory agencies should offer appropriate price and conditions to encourage the use of landfill gases for electricity generation.
- The CCME and NAICC should evaluate and define conditions under which adoption of the Code by operators of municipal solid waste landfills should be considered a mandatory requirement by October, 1995.

Option 2

- The Canadian Council of Ministers of the Environment (CCME), in collaboration with the NAICC should establish a national reduction target for landfill GHG emissions by a date to be decided.
- Environment Canada, in collaboration with Natural Resources Canada, the Canadian Electrical Association (CEA) and other stakeholders, should undertake a qualitative assessment of the realistic technical and economic potential of using landfill gas to generate electricity and effect a reduction in the current utility use of fossil fuel(s).

NON-ENERGY SECTOR MEASURES

- Environment Canada, in collaboration with appropriate provincial government agencies and other stakeholders, should coordinate the development of an Environmental Code of Practice for Solid Waste Landfill Gas Management. This Code would identify and share best engineering and operating practices and identify the economic implications of its implementation on the basis of typical case studies.
- Environment Canada, in collaboration with appropriate provincial agencies, should promote the voluntary adoption of this Code by operators of municipal solid waste landfills.
- Municipal and private waste landfill operators should voluntarily install gas recovery systems.
- The NAICC, or a designated Task Group thereof, should ensure that efforts to develop voluntary agreements are coordinated with and recognized as a component of other Measures where/as necessary, e.g., the National Challenge Program, the National Registry for Voluntary Action.
- The CCME and NAICC should evaluate and define conditions under which adoption of the Code by operators of municipal solid waste landfills should be considered a mandatory requirement by October, 1995.

7.2 REDUCE METHANE EMISSIONS FROM COAL MINES

Environment Canada, in collaboration with Natural Resources Canada, the Coal Association of Canada and other stakeholders, will work to further develop information on methane emissions from coal mining operations, and encourage recovery and utilization where practical, safe, and economic.

Overview

An estimated 0.3% of Canada's 1990 total equivalent GHG emissions were released by coal mines in Nova Scotia, Alberta, British Columbia, Saskatchewan and New Brunswick. About 60% of these (methane) emissions were from underground mines in Nova Scotia, 35% from open pit mines in the Rockies foothills region, and 5% from strip mines in the Plains region. Further work is required to refine the current estimates of coal mine emissions, particularly those associated with western Canadian coals.

Technologies to recover mine methane include pre-mining degasification for underground and surface mines, enhanced gob well recovery from fractured rock in underground mining operations, and ventilation air recovery for underground mines. In a Canadian context, the current order of the relative GHG emissions reduction potential of these technologies is: 1) enhanced ventilation air and gob well recovery for underground mines; and 2) pre-mining degasification for new mines. Backfilling and flooding of worked-out underground mines could prevent further methane emissions but has not yet been subjected to detailed review. The 1990 level of coal mine methane emissions have been reduced to some degree by the unanticipated flooding and subsequent closure of the Lingan mine in Nova Scotia.

Potential use options for mine gas depend largely on the methane concentration of the gas. For example, high quality gas from pre-mining degasification activity (which could be greater than 90% methane) and some medium quality gob well gas (which contains 30% to 80% methane) can be flared or used for on-site electricity generation. Low quality ventilation air (which contains less than 1% methane) cannot be combusted directly but could be used as a source of make-up combustion air for local gas turbines or boilers in electrical generating plants. It may be possible to apply an integrated combination of these options to underground mines (Neill and Gunter, March, 1994).

Description of Actions

- Environment Canada, in collaboration with Natural Resources Canada and the Coal Association of Canada, will coordinate an evaluation of the technical and economic feasibility of retrofitting methane recovery systems to both existing and future coal mining operations.
- Where feasible provinces and coal mine operators will be encouraged to recover methane.

7.3 CONTROL EMISSIONS OF HFCs AND OTHER SUBSTITUTES FOR OZONE LAYER DEPLETION SUBSTANCES (ODS)

Environment Canada, in collaboration with the Heating, Refrigeration and Air Conditioning Institute of Canada and other stakeholders, will expand the "Code of Practice for the Reduction of Chlorofluorocarbon Emissions from Refrigeration and Air Conditioning Systems" to include Hydrofluorocarbons (HFCs) and Hydrochlorofluorocarbons (HCFCs). Provinces will develop regulations as appropriate. Users will adopt voluntary practices, which will effectively control emissions of these substances to the extent practicable.

NON-ENERGY SECTOR MEASURES

Overview

HFCs and HCFCs are being used as substitutes for Chlorofluorocarbons (CFCs), halons, and other ozone layer depletion substances which are being phased out of production under the Montreal Protocol. These substitutes for CFCs will increasingly be used in equipment and services such in refrigeration systems, heat pumps, air conditioning systems, and cleaning solvents. In 1990, there were no significant emissions of HFCs and HCFCs in Canada.

In 1990, there were no significant emissions of HFCs and HCFCs in Canada. Although emissions are currently not significant in terms of quantity, HFCs and HCFCs are powerful greenhouse gases with a reported Global Warming Potential of 3400 relative to carbon dioxide (Climate Change Program Board, 1993).

While the phase out and control of CFCs will reduce the rate of ozone layer depletion, releases of their substitutes must also be controlled to minimize potential greenhouse effects. Technologies have been developed to recover and re-use CFCs and similar substances. Many of these techniques and practices could be applied to the control of emissions of HFCs, HCFCs, and other substitutes for ODS.

Description of Actions

- Environment Canada, in collaboration with the Heating, Refrigeration and Air Conditioning Institute of Canada and other stakeholders, should expand the existing "Code of Practice for the Reduction of Chlorofluorocarbon Emissions from Refrigeration and Air Conditioning Systems" (the Code) to include Hydrofluorocarbons (HFCs) and Hydrochlorofluorocarbons (HCFCs).
- Environment Canada, in collaboration with stakeholders, should continue training and information programs to control emissions of HFCs and HCFCs.
- Provinces should adopt uniform regulations across Canada as appropriate to re-cover and re-use HFCs and HCFCs.
- Industrial stakeholders have suggested that more uniform regulatory requirements across Canada would assist in control of ODS.

7.4 REDUCE EMISSIONS FROM ALUMINUM SMELTERS

Environment Canada, in collaboration with l'Industrie de l'Aluminium, Environnement Quebec, and other appropriate stakeholders, will evaluate the technical and economic feasibility of developing new low-emission PFC technology for existing Canadian smelters. It will coordinate the development of an "Aluminum Industry Challenge Program" aimed at securing voluntary agreements for emission reductions from specific smelters.

Overview

Polyfluorocarbon (PFC) emissions from aluminum smelters located in Quebec and British Columbia accounted for an estimated 1.15% of Canada's 1990 total equivalent GHG emissions. In 1990, there were nine aluminum smelters in Canada; two additional smelters commenced operation in 1992.

Polyfluorocarbons (PFCs) are powerful, long-lived GHGs which include tetrafluoromethane (CF_4) and hexafluoroethane (C_2F_6). To put this into perspective, it is estimated that CF_4 and C_2F_6 have global warming potentials of about 5,000 and 10,000 times that of CO_2 respectively, and lifetimes in excess of 10,000 years. PFCs are emitted primarily as the result of an "anode effect" in the electrolysis of alumina in a molten cryolite electrolyte.

It has recently been found that older aluminum smelters using horizontal stud Soderberg (HSS) technology tend to emit 30% to 60% more PFCs than those using the newer "Prebake" anode technology (Unisearch, March, 1994, and Bell, March, 1994). While most Canadian smelters already use the new Prebake technology, there may be opportunities to develop low-emission PFC techniques for other facilities.

Description of Actions

- Environment Canada, in collaboration with l'Industrie de l'Aluminium, Environnement Quebec, and other appropriate stakeholders, should evaluate the technical and economic feasibility of developing new low-emission PFC technology for existing Canadian smelters and provide a report on the results of this evaluation to the NAICC by February, 1995.
- The NAICC, in collaboration with stakeholders, should establish targets and schedules for PFC emission reductions from high-emitting smelters by October, 1995.
- Environment Canada, in collaboration with appropriate stakeholders, should coordinate the development of an Aluminum Industry Challenge Program aimed at securing voluntary agreements which will achieve the targets established by the NAICC. Environment Canada will issue a status report in this regard to the NAICC by February, 1996.

NON-ENERGY SECTOR MEASURES

- Voluntary agreements should be developed between owners of individual smelters and appropriate federal and provincial agencies by June, 1996. These agreements would include implementation action plans and a strategy for reporting progress.
- The NAICC, or a designated Task Group thereof, should ensure that industry efforts to develop voluntary agreements are coordinated with and recognized as a component of the National Challenge Program and the National Registry for Voluntary Action.
- The NAICC should review the projected effectiveness of the Aluminum Industry Challenge Program, the progress made in achieving national targets and schedules, and the need for further economic instruments and mandatory regulations, by October, 1996.

7.5 REDUCE EMISSIONS FROM AN ADIPIC ACID PLANT

Formalize in a voluntary agreement the commitment by DuPont Canada to reduce the nitrous oxide emissions from their Maitland, Ontario adipic acid plant by 95% by 1996. Signatories to this agreement would be DuPont Canada, the Ontario Ministry of Environment and Energy, and Environment Canada. The Agreement would be registered in the National Registry of Voluntary Mitigation Actions.

Overview

An estimated 1.6% of Canada's 1990 total equivalent GHG emission was associated with release of nitrous oxide from an adipic acid plant located in Maitland, Ontario. This plant, which is the only one of its type in Canada, is owned by DuPont Canada. It produces an intermediary used in the production of nylon. DuPont has investigated various options to reduce nitrous oxide emissions from this facility including thermal destruction, recycling and conversion to nitrogen monoxide. Their evaluation has led DuPont to choose "catalytic disassociation" of nitrogen and oxygen as the preferred emission reduction technology. The company expects the technology to reduce nitrous oxide emissions by 95%.

Description of Actions

- Environment Canada should spearhead a multi-lateral agreement to formalize the Dupont commitment to achieve a 95% reduction in the nitrous oxide emissions from its Maitland facility by 1996.
- The NAICC, or a designated Task Group thereof, should ensure that this effort is recognized as a key element of the National Challenge Program.

7.6 INVESTIGATE OPPORTUNITIES TO SEQUESTER AND UTILIZE CARBON DIOXIDE

CANMET is to take the lead in coordinating research amongst provincial and industrial research agencies for the technology and the market mechanisms to cost effectively sequester and utilize CO₂.

Overview

To date, most of the work conducted on global warming and the reduction of greenhouse gases reaching the atmosphere has been from the viewpoint that these gases were waste products to be eliminated. This is particularly true of CO₂. Changing our viewpoint to one that these gases present opportunities can lead us to investigate their economic utilization.

Description of Actions

CANMET will take the lead in coordinating research among relevant agencies at a provincial level, and among industry and universities. A national fund should be established to provide research incentives. Carbon offsets will be available to large generators of CO₂ on the basis of their research investments and success in carbon sequestration. Research and development will be undertaken in areas which display reasonable promise of commercial success. It will be the role of industry to further demonstrate and market the product/technology.

7-II FORESTRY SOURCES AND SINKS

7.7 PROMOTE TREE PLANTING IN URBAN AND AGRICULTURAL SETTINGS

The measure is based on two initiatives: urban forestry, and afforestation of agricultural lands. Both will help offset greenhouse gas emissions through carbon sequestration, but only the former will actually reduce fossil fuel consumption by reducing heating and cooling demands.

Overview

Urban forestry

This initiative involves protecting, enhancing and expanding Canada's urban forests. Given appropriate siting and species selection, urban forests can play an important role in reducing the energy demand for heating and cooling. Trees in urban areas also contribute to the sequestering of carbon dioxide emissions.

No national estimates are available on the potential for GHG emissions reductions from tree planting (i.e., the potential associated with reduced energy demand for heating and cooling). However, U.S. research has shown that trees can lower peak energy demands in urban areas by 20% to 40%. A Canadian study, "The Tree-House Effect" (FOE 1991), provides simulation results showing on average that heating energy in Toronto can be reduced by 10% in urban residential neighbourhoods, and cooling costs can be reduced by 40%. A study by the American Environmental Protection Agency, "Cooling our Communities", indicates that the annual amount of carbon saved per tree from cooling energy savings is 40 kg per tree per year.

The target of the Canadian Forestry Service's program *Tree Plan Canada*, to which urban forestry initiatives are expected to make a substantial contribution, gives an indication of the potential for offsetting GHG emissions via sequestration. With an objective of 325 million trees planted (325,000 hectares) during each of two five-year funding cycles, the program is expected to result in some 5.2 million tonnes of carbon dioxide being absorbed by the year 2000. This is equivalent to about 1% of annual carbon emissions that were forecast for Canada for the year 2000.

Afforestation of agricultural lands

This initiative involves supporting afforestation of marginal and idle agricultural lands, and the planting of windbreaks, actions which will contribute to carbon sequestration by increasing the size of Canada's forest carbon sink.

MEASURES TO REDUCE GREENHOUSE GASES

Based on conservative estimates provided by CFS regional offices, 1.3 million hectares of marginal or idle agricultural land are available for tree planting. Most of this land is located in Ontario and the prairie provinces. Planting less than half of this (30%) would achieve, along with expected urban accomplishments under *Tree Plan Canada*, the original ten year target of 650,000 hectares, for an approximate 1% offset of annual carbon dioxide emissions by the year 2000.

Description of Actions

Urban Forestry

The main goals for urban forestry would be:

- Reductions in energy consumed in heating and cooling, by planting trees around commercial and residential buildings/homes, parking lots and open spaces to break-up "heat islands" and buffer against winter winds.
- Maintenance of the health of existing urban forests, to enable continued sequestration of carbon in healthy, growing trees, and minimize releases of the carbon that is currently tied up in these trees.
- Tree planting and maintenance on degraded natural urban landscapes and in and around other open areas, which would integrate the benefits of carbon sequestration with ecological and aesthetic rehabilitation and restoration.

Urban forestry efforts have already engaged the support and/or direct involvement of players from a wide range of sectors, including federal, provincial, regional and municipal governments, corporations (primarily wood product producers and users), national and regional NGOs, and community-based organizations. Typically, federal, provincial and corporate support (financial, technical and scientific, promotional, and organizational) is channelled through regional governments, municipalities and NGOs, to community-based participants who undertake the planting.

Proposed approaches to maximizing the potential for these initiatives would include: a more decisive federal role in focusing municipal and corporate commitment to urban forestry; a focussing of federal R&D efforts to support effective planting (e.g., scientific and technical support to maximize strategic benefits, improve seedling and sapling survival, etc.); greater overall sponsorship, and continued sharing of costs between federal, provincial, municipal, corporate and other players; and continued development of partnerships to increase planting efforts and maintenance, and to ensure coordination of efforts to support a range of environmental benefits.

NON-ENERGY SECTOR MEASURES

The key role of regional governments and municipalities should be recognized and supported, as should community-level participation in planting and maintenance. Utility companies could also play a potentially key role in source reduction of GHG emissions via reduced energy consumption through support for strategic tree planting by customers.

The federal government is interested in continuing to play a key role through the establishment of three to four year Urban Forestry Agreements with municipalities. A particular focus would be on strategic planting to reduce the energy demand for fossil fuel use. The Canadian Forest Service has also created a non-government charitable foundation, the National Community Tree Foundation, to solicit additional funding for *Tree Plan Canada* through corporate sponsorship. Another federal role would be in applied research and development of "green" technologies. The focus with regard to urban forestry would be on ecologically sustainable management of urban forests, the effects of the urban forest on energy use, rehabilitation and restoration of natural urban landscapes, economic valuation of trees and urban forests, insect/disease identification and control, and urban tree genetics.

Afforestation of agricultural lands

With regard to rural forestry, the focus would be on increasing afforestation of marginal agricultural land, and increased planting of windbreaks. A smaller range of players is involved in these efforts -- primarily federal and provincial governments and agricultural land owners. Consultations between federal and provincial governments (forestry and agriculture ministries) are required to ensure cooperative participation, limit program overlap, and harmonize goals.

7.8 SUBSTITUTE WOOD PRODUCTS FOR STEEL AND CONCRETE IN THE COMMERCIAL BUILDING SECTOR

The goal is to increase the use of energy-efficient wood products in place of energy-intensive materials -- mainly steel and concrete -- in the building sector. Federal leadership will be provided in designing and implementing a substitution program.

Overview

For some new building construction applications, the substitution of wood for steel can have significant GHG reduction potential. Based on early results from a Canadian modelling process which assesses the relative environmental implications of various building materials in defined applications, substitution of steel by wood in commercial buildings of four stories or less would reduce greenhouse gas emissions. A steel stud wall uses two to three times more energy than a wood stud wall, and results in two to five times higher emissions of carbon dioxide than a wood wall. The use of wood versus steel also results in lower emissions of other greenhouse gases such as carbon monoxide, sulfurous oxides and nitrous oxides. In addition to reductions

MEASURES TO REDUCE GREENHOUSE GASES

in energy consumption and carbon dioxide emissions, proper use of wood in buildings could contribute to carbon sequestration in wood.

The model was developed by a Canadian research alliance of public and private sector organizations. The alliance looked beyond simple environmental measures and impacts, to underlying environmental trade-offs inherent in decisions to use or not use specific building materials. The model, designed by Forintek Canada, is intended for use by the building community. Also of relevance is a 1991 CMHC computer program, Optimize, which estimates the lifecycle energy and environmental impacts of housing, focussing primarily on the embodied energy of a range of building materials.

Description of Actions

Short-term activities

- Education and promotion efforts should focus on the use of off-the-shelf products that are readily available. Consumers will be informed of savings in energy consumption and the decrease in CO₂ emissions resulting from the use of such products. The use of wood components (versus steel) in building systems dedicated to light commercial structures will be fostered. The longevity and durability of wood, when properly used, should be promoted. This may involve encouraging users to take the steps necessary to ensure proper protection of wood structures.
- The model by the Forintek Alliance should be further developed, to look at light-duty industrial and commercial buildings. The refined model would include residential units, and encompass an extensive database on various aspects of those alternative systems.

Medium-term

Medium-term initiatives would focus on the design of new construction methods and building systems, and the new products required for these systems.

The development and implementation of recycling processes for wood wastes (including paper and treated wood products) would be promoted. The utilization of these sources of fibre would slow down wood degradation, hence the release of carbon into the atmosphere. Additional benefits include reduced pressure on landfill sites and production of saleable, value-added products (composite materials for structural and non-structural purposes).

Research should be undertaken into ways to reduce the energy requirements for drying wood. Most new uses that will be developed will call for dry wood of high quality. This wood can take the shape of either massive blocks or joined sections.

NON-ENERGY SECTOR MEASURES

Ways to substitute plastics by wood-derived products in the packaging industry should be explored. Some background information on this topic was gathered in 1990 by a working group of the Canadian Council of Ministers of the Environment (CCME).

Ways of channelling wood fibre produced during thinning operations into asphalt-based products should also be explored. There is a potential for reduced emissions originating from the asphalt process.

Long-term

Based on the existing information and future findings, revisions should be made to the National Building Code of Canada to take into account the environmental impacts related to various building systems.

Research to extend the longevity of wood structures in service, using environmentally benign processes, needs to be undertaken. This would include physical, chemical and biological protection methods.

7-III AGRICULTURE

7.9 REDUCTION IN SUMMER FALLOW ACREAGE

Measure Elaboration: Shift to continuous cropping from current practice on some Prairie farms of leaving ploughed land unseeded during growing season; continuous ground cover enhances carbon sequestering capacity of soil.

Target Sub-Markets: Croplands with summer-fallow rotations

Target End-Users/Technologies: Prairie farmers in drier grain growing districts who use summer-fallowing to conserve soil moisture.

Instruments: Agriculture Canada, in collaboration with provincial government agencies and farm organizations, should continue current education and extension services which encourage continuous cropping of cultivated soils.

7.10 SOIL TILLAGE REDUCTION AND ELIMINATION (no-till seeding)

Measure Elaboration: Shifting to no-till seeding practices from conventional tillage practices reduces the rate of oxidation of soil organic matter (reduced carbon dioxide emissions).

Target Sub-Markets: Croplands cultivated using conventional tillage practices.

Target End Users/Technologies: Farmers who use conventional tillage practices.

Instruments: Agriculture Canada, in collaboration with provincial government agencies and farm organizations, should continue current education and extension services which encourage adoption of no-till seeding practices; in addition, TransAlta Utilities and SaskPower have proposed issuance of tradeable soil carbon certificates to farmers using no-till seeding practices as offsets to GHG emissions from power generation.

7.11 INCREASED PERENNIAL FORAGE CROP PRODUCTION

Measure Elaboration: Shifting from grain and oilseed to perennial forage crop production enhances carbon sequestering capacity of soil since cultivation of forage crops generally results in higher soil organic matter levels.

Target Sub-Markets: Prairie croplands currently in grain and oilseed production, especially marginal lands that are less suitable for intensive crop cultivation.

NON-ENERGY SECTOR MEASURES

Target End Users/Technologies: Prairie farmers who currently cultivate grain and oilseed on marginal lands.

Instruments: Permanent Cover Program, which ended in 1993 and was administered by Prairie Farm Rehabilitation Administration (PFRA) of Agriculture and Agri-Food Canada, made acreage-based payments to farmers to enter into 10- and 21-year contracts to convert marginal land use from grain and oilseed production to perennial forage crops; about 500,000 hectares were converted; new Permanent Cover/National Soil Conservation program has been proposed.

7.12 IMPROVED CROP YIELDS

Measure Elaboration: Higher crop yields result in greater absorption of carbon dioxide through photosynthesis, and enhanced carbon sequestering capacity in soil.

Target Sub-Markets: Canadian croplands.

Target End users/Technologies: Canadian farmers engaged in crop production.

Instruments: Research and development activities by Agriculture and Agri-Food Canada, provincial government agencies and farm organizations; crop yields expected to continue to improve through further advances in plant breeding, crop fertilization and cultural practices.

Note on Measures 7.9 through 7.12: The above measures each involve enhanced effectiveness of agriculture as a carbon sink which will reduce GHG emissions through photosynthesis/increased soil carbon levels. Research in crop physiology has shown that crop plants respond to an increase in atmospheric carbon dioxide levels by increasing the rate of photosynthesis and by reducing the rate of transpiration (water loss from evaporation through plant leaves). An increase in atmospheric carbon dioxide levels should mean, therefore, increased crop biomass yields and increased amounts of organic matter added annually to farm soils, and an improvement in soil water efficiency. In addition, longer growing seasons associated with global warming should mean longer periods of photosynthetic production in Canadian agriculture. This "feed back" effect is not expected to be large to the year 2005 but in the longer term it should be substantial.

7.13 REDUCTION IN METHANE EMISSIONS FROM RUMINANT FARM ANIMALS

Measure Elaboration: Reducing methane emissions from ruminant farm animals (cows, horses, sheep, etc.) through improvements in feeding technology and increased use of feed additives which improve rumen efficiency.

Target Sub-Markets: Livestock operations.

Target End-Users/Technologies: Farmers engaged in livestock production, including dairy farmers, and feedlots operators.

Instruments: Utilize research and development activities by Agriculture and Agri-Food Canada, provincial government agencies and farm organizations, supplemented by education and extension services. Reduced methane emissions would be achieved through improvements in feeding technology and increased use of feed additives to improve rumen efficiency.

7.14 REDUCTION IN EMISSIONS OF METHANE AND CARBON DIOXIDE FROM LIVESTOCK MANURE

Measure Elaboration: Improved manure storage and utilization practices reduce emissions of methane and carbon dioxide.

Target Sub-Markets: Livestock operations.

Target End Users/Technologies: Farmers engaged in livestock production, including dairy farmers, and feedlot operators.

Instruments: Utilize research and development activities of Agriculture and Agri-Food Canada, provincial agencies and farm organizations, supplemented by education and extension services; possible continuation of capital grants offered in some provinces to offset costs of manure storage facilities and application equipment.

7.15 REDUCTION IN EMISSIONS OF GHG GASES ASSOCIATED WITH PRODUCTION OF MINERAL NITROGEN FERTILIZERS

Measure Elaboration: Increased usage of perennial forage legumes and livestock manure as source of nitrogen fertility reduces requirement for purchased nitrogen fertilizer in form of urea, anhydrous ammonia and ammonium nitrate.

(Note: measure only involves source of nitrogen; nitrous oxide emissions from soil after application would not be affected)

Target Sub-Markets: Canadian croplands.

Target End Users/Technologies: Canadian farmers engaged in crop production.

NON-ENERGY SECTOR MEASURES

Instruments: Agriculture Canada, in collaboration with provincial government agencies and farm organizations, should continue education and extension services which encourage use of on-farm sources of nitrogen fertility.

7.16 REDUCTION IN FOSSIL FUEL USAGE FOR FARM OPERATIONS

Measure Elaboration: Continued adoption of more energy-efficient technology reduces amount of petroleum fuels used in field operations.

Target Sub-Markets: Canadian farming operations.

Target End users/Technologies: Canadian farmers.

Instruments: Research and development activities by Agriculture and Agri-Food Canada, provincial government agencies and farm organizations, supplemented by education and extension services.

7.17 EXPANDED PRODUCTION AND USE OF FUEL ETHANOL

Measure elaboration: Continued expansion in production and usage of grain-source fuel ethanol as substitute for fossil fuels reduces net carbon dioxide emissions from agriculture and other sectors.

Target Sub-Markets: Canadian economy.

Target end users/Technologies: All Canadian users of fossil fuels.

Instruments: Technology exists for commercial manufacture of fuel ethanol from grain; high protein co-products from ethanol manufacturing are used very efficiently in beef and dairy cattle nutrition; lower federal government fuel tax on retail sales of ethanol-blended gasoline, relative to regular gasoline, should be retained.

PART III

ADAPTATION MEASURES

ADAPTATION: TOWARDS A COMPREHENSIVE APPROACH

What is Adaptation?

Adaptation has been defined as "the harmonization of human activities and ecosystems with a changing and variable climate in the context of sustainable development." (Canadian Climate Centre, 1992). Evidence that humans have the capability of adapting to climate is evident in the fact that humans settle, make a livelihood and develop culture in almost every climatic region of this planet. However, limits to human adaptability to climate are demonstrated by the social and economic losses associated with extreme climatic events including droughts, unseasonal frosts, floods and changes in ocean currents.

Climate adaptation is a decision process based in part upon an assessment of what needs to be done in anticipation of future conditions or events. Such assessments are routinely made for example by farmers (plant later, choose another crop, harvest now), retailers (what goods to stock when), building designers and contractors (the strength of walls and roofs, the size of culverts) and so on. In so doing, they rely on three types of information;

1. Direct Sense Experience: from time to time we all look at the sky before deciding what to do.
2. Detailed Analysis of Climatic Data: each spring, many of us rely on historical climate data to determine when it will be safe to plant the geraniums.
3. Theoretical Models of Relationships Between Climatic Parameters and Human Activities. (source: Burton, 1991)

Adaptation can further be defined in terms of types of human responses to severe weather and degradation of the environment. These can be classified as follows: 1) modify the hazard;

2) prevent or limit the impacts; 3) move or avoid the loss; 4) share the loss (as in insurance); or 5) bear the loss. (source: National Academy of Sciences, 1991). It is from these types of responses that adaptation measures can be drawn.

Why Adaptation?

The science and the emerging policy for climate change have both focused heavily on the reduction of greenhouse gas emissions. Some have expressed a concern that the development of adaptation strategies encourages "acquiescence in a dangerous situation which has been created by human activities, is being exacerbated by the status quo, and should be remedied." (Smit, 1993). Politically, adaptation has been viewed as an expression of weakness in implementing limitation measures.

However, it is now widely accepted by the scientific community that a certain change in the climate is inevitable, regardless of the rate and stringency of the limitation measures adopted.

The United Nations Framework Convention on Climate Change recognizes this fact and calls for all parties to "formulate, implement, publish and regularly update national and, where appropriate, regional programmes containing measures to ... facilitate adequate adaptation to climate change." (United Nations, 1992)

Successful adaptation to climate potentially provides economic benefits to all Canadians. Becoming a more efficient society is a benefit in many ways, regardless of a change in climate. Preparing for climate change now also empowers Canadians to not only cope with the impacts of climate change, but to thrive within the changing environment. "Regardless of long-term climate change ... climate is variable. Societies and economies function within a capriciously fluctuating climatic environment, which results in all sorts of vulnerabilities and opportunities for adaptation." (Smit, 1993) .

It is no longer sufficient to provide detailed, high quality technical advice on climate norms and extremes, although this work is essential. All sections of the Canadian society must be alerted to the need to think anew about climate adaptation in a much more self-conscious way.

Other reasons for developing an adaptation program follow:

- The amount of time needed to carry out the adaptation is long so action must be taken now;
- Stringent limitation measures themselves will require societies to adapt;
- There are benefits to be gained now from better adaptation. In Canada, it is estimated that annual expenditures on adapting to climate (including the protection of Canadians from climate extreme) amounts to some \$9 billion per year. The adaptation that is now in place is not optimal. We suffer to a greater extent from some climatic extremes than necessary, because Canadian society and economy is not as well adapted as it might be;

ADAPTATION MEASURES

- The distinction between limitation and adaptation is arbitrary. Many adaptive strategies can also contribute to the reduction of greenhouse gas emissions; and
- Even if industrialized economies agree to respond rapidly and find the technology and financial resources to do so, the developing countries, especially those with large coal reserves are expected to increase their CO₂ emissions substantially over the next decades.

Adaptation as a Component of Successful Strategy to Deal with Climate Change

Successful adaptation cannot replace the necessity to reduce greenhouse gas emissions. It may, however, slow the rate at which limitation measures will have to be implemented. It has become clear that reduction of greenhouse emissions on a fast enough track to prevent all climate change is a most difficult, if not impossible task.

Adaptation measures should therefore be implemented in conjunction with limitation measures to ensure a well balanced and comprehensive approach not only to cope with the impacts of climate change, but to reap the benefits where possible. If Canadians are aware now of the changes to the climate that are expected, they will be given a vital advantage to preparing for and managing the changes when they are realized.

By adapting economic activities and social behaviour to climate change, Canada can enhance social development, reduce vulnerability to climate and atmospheric change and take maximum advantage of climate opportunities (Smit, 1993). Successful adaptation cannot replace the necessity to reduce greenhouse gas emissions, but it can slow the rate at which limitation measures will have to be implemented. The United Nations Framework Convention on Climate Change states that a certain amount of global warming is now inevitable and the Convention calls for all parties to "formulate, implement, publish and regularly update national and, where appropriate, regional programmes containing measures to ... facilitate adequate adaptation to climate change." (United Nations, 1992). It is also widely accepted that nations can protect themselves from damage by living harmoniously with their atmospheric environment but have not always done so. In fact, damage from atmospheric change can at least in part be attributed to the insensitivity of human activities to the atmospheric environment.

Adaptation is not proposed as a reason to avoid or delay limitation of greenhouse gas emissions but as a necessary component of a comprehensive strategy for coping with the realities of atmospheric change. It is also important to consider what adaptation measures will be required to adapt to the consequences of limitation measures, should strong limitation measures be adopted.

Many adaptive measures are taken spontaneously without government leadership or intervention. However, coping with the realities of climate change will require the development of a National Action Plan which includes both limitation and adaptation measures. Integration of the impacts of all atmospheric changes is also required for the development of a comprehensive adaptation

program. Adaptation measures designed to deal with climate change alone might be counter productive.

Until now, much less attention has been directed to the need for the development of adaptation component of the National Action Plan. It is therefore suggested that an effective adaptation program is required which will outline integrated adaptation measures required to deal with all of the impacts associated with atmospheric change. Before this is done, however, it is necessary to establish a base from which these recommendations can be made with a level of confidence.

In this portion of the report the detailed discussion of foundation measures required for the development of an adaptation program are presented, along with examples of other types of measures to be further developed.

Adaptation measures can be categorized into three groups: foundation, tactical and strategic.

The measures described in this part are included for illustrative purposes only. They have not yet been assessed or discussed with the relevant stakeholders.

Due to their preliminary status, the level of detail and presentation format for the adaptation measures identified are less developed than those for the measures in other parts of this Report.

1. FOUNDATION ADAPTATION MEASURES

Much uncertainty surrounds the present understanding of expected impacts of climate change. There is also uncertainty regarding the effectiveness of limitation strategies to stop or slow the rate of human induced climate change. For this reason, it is necessary to establish a level foundation upon which to build a comprehensive adaptation program.

Canada has been a pioneer in the scientific work on adaptive environmental management, as for example, in Canadian contributions to the work of International Institute for Applied Systems Analysis (IIASA) in Vienna. Unfortunately, Canada has lagged in the application of this research in its own national policies. What is ultimately involved is the development of adaptive strategies and tactics as an integral part of all environmental management.

The following five foundation adaptation measures, developed in consultation with the appropriate federal agencies, are recommended to assist in the formulation and implementation of an adaptation program;

- 1.1 Develop a Public Information Program on Adaptation
- 1.2 Consider Atmospheric Change in Environmental Assessment Process
- 1.3 Consider Atmospheric Change in the Development of New Technology
- 1.4 Consider Atmospheric Change in the Development of Major Infrastructure Projects and the Construction Industry.

1.1 DEVELOP A PUBLIC INFORMATION PROGRAM ON ADAPTATION

Develop a program to inform and educate the public about adaptation to atmospheric change that would enable them to cope with the expected changes in all facets of their life.

Background

The Framework Convention on Climate Change recognizes the need for public education, participation and access to information in the response to climate change.

Progress is being made in educating the Canadian public about atmospheric change through the Communications Directorate of the Environmental Protection Service. However, many people still assume that atmospheric change is a result of industrial pollution and do not feel individuals can take actions to protect the atmosphere or, perhaps of more relevance, will have to take action to adapt to a changing atmosphere.

Objective

To enhance existing public education programs so that they include a component to educate people about adaptation to atmospheric change to enable them cope with the expected changes, and to use these changes to their advantage.

Action

In consultation with the Communications Directorate of the Environmental Protection Service and within with the Environmental Citizenship Initiative, enhance the component of the program which will provide comprehensive information on adapting to the impacts of the six major air issues.

1.2 CONSIDER ATMOSPHERIC CHANGE IN ENVIRONMENTAL ASSESSMENT PROCESSES

Ensure with the help of National Guidelines that the possible impacts of atmospheric change are considered in existing environmental decision-making processes for major projects and government programs.

Background

There are several existing channels for environmental decision making at several levels of government of Canada. The federal government has the *Canadian Environmental Assessment* (CEAA), the Environmental Assessment Review Process (EARP) and the Assessment Process for Policy and Program Proposals. Many provinces have their own environmental assessment and land use legislations and, to varying degrees, regional and municipal levels of government also have requirements for environmental impact assessment.

The basic objectives of environmental assessment are as follows;

- To ensure that the environmental effects of projects receive careful consideration;
- To encourage actions that promote sustainable development, thereby achieving or maintaining a healthy environment and a healthy economy;
- To ensure that projects to be carried out in Canada or on federal lands do not have significant adverse environmental effects;
- To ensure that there be an opportunity for public participation in the EA process.

In order to ensure atmospheric change is given due consideration in the process, it is necessary to establish a standard means of evaluating atmospheric change which is acceptable to all stakeholders, perhaps in the form of national guidelines.

ADAPTATION MEASURES

Objective

To ensure that the impacts of atmospheric change are considered in existing environmental decision making processes for major development projects, plans and government policies and programs.

Action

Investigate means of incorporating a streamlined and consistent approach so that a proponent can assess the impact on the atmosphere of a project, proposal, policy or program. It should also allow the proponent to assess the impact of climate change on a project, proposal, policy and program.

1.3 CONSIDER ATMOSPHERIC CHANGE IN THE DEVELOPMENT OF NEW TECHNOLOGY

With a national strategy promote the development of technology designed to adapt to conditions under expected atmospheric change.

Background

The environmental technologies and services industry is among the top Canadian industries judged to have long-term competitive strengths. In addition, because of the varying climate regimes across the country, Canada is in an advantageous position in terms of developing technologies to adapt to differing climate scenarios. Adaptive technology can include things such as water efficient technology or energy efficient technology for use in areas of water or resource shortages. In addition, many of these technologies can be characterized as "minimal regret" and applied regardless of climate change.

The present government is committed to funding the research and development of technologies that reduce the harmful effects of industrial activity on the environment, or that enhance the environment. To meet this commitment, the government is establishing three technology advancement centres to foster Canada's international competitiveness through development, commercialization and application of environmental technology.

It is important that atmospheric change is used as a criterion in the development stage of new technologies in order to ensure the long term success of these developments and to enhance the increased efficiency of the Canadian economy. An example of an adaptive technology includes the promotion and investigation of water efficient technology.

Objective

To ensure the long term viability of new environmental science and technology.

Actions

Incorporate the integrated assessment of atmospheric change impacts into the development of new environmental technology and industry.

Find a means to promote opportunities for technology and industrial development in the area of atmospheric change.

1.4 CONSIDER ATMOSPHERIC CHANGE IN THE DEVELOPMENT OF MAJOR INFRASTRUCTURE PROJECTS AND THE CONSTRUCTION INDUSTRY

Through the use of applied guidelines and standards assess new infrastructure development and major infrastructure maintenance in the light of atmospheric change.

Background

The government is committed to establishing a program to renew Canada's infrastructure. By investing in state-of-the-art infrastructure, the skills and technological expertise of Canadians will be enhanced, creating development opportunities and domestic markets for such expertise. It is vital to incorporate an assessment of the impacts of climate change in order to ensure that this infrastructure meets the objectives of adaptation and is therefore viable in the long term.

Objective

To ensure viability of Canada's infrastructure in the long term by incorporating the consideration of climate change and other atmospheric issues.

Action

Introduce the assessment of the impacts of atmospheric change into the process of developing and renewing infrastructure projects.

2. SECTORAL STRATEGIC AND TACTICAL ADAPTATION MEASURES

Background

Tactical Adaptation Measures

At the lowest level of adaptation, there are large number of very specific actions that can be taken to reduce the adverse impacts of climate on society, economy and ecosystems. The potential for such actions is immense and requires more research and consultation before serious recommendations can be made. For illustrative purposes, this report will describe only a select few.

Strategic Adaptation Measures

Adaptation measures can also be developed and adopted at a more strategic level. This would include measures that have broad impact across economic sectors and are less dependent upon adoption by individual decision makers.

Sectors

This section briefly describes the possible tactical and strategic adaptation measures within various sectors. The measures are categorized as follows:

- 2.1 Agricultural Sector Adaptation Measures
- 2.2 Water Resources Sector Adaptation Measures
- 2.3 Forestry Sector Adaptation Measures
- 2.4 Hazard and Coastal Zone Management Sector Adaptation Measures
- 2.5 Urban Infrastructure and Construction Industry Sector Measures

As noted previously, the measures discussed within the sectoral categories that follow are included for illustrative purposes only. They have not yet been assessed or discussed with the relevant stakeholders.

2.1 AGRICULTURAL SECTOR ADAPTATION MEASURES

Agriculture is an essential activity in Canada. In some parts of the country, such as Saskatchewan, it is the key economic sector. Agriculture is also widely accepted as being very sensitive to climate. Impacts on agriculture as a result of climate change will be regional by nature as some areas can expect increased yields and will be viable for some crops for which

they are not presently viable. Other areas can expect great losses in productivity. Without appropriate adjustments, losses to the agricultural sector could be significant. (Smit, 1989). Climate may also extend the geographic range of some insect pests presently limited by temperature.

As in all sectors, the impacts associated with agriculture as a result of climate change are still uncertain. It is possible that a warmer climate may lead to the expansion of agricultural lands northward, assuming that soil capability would support agriculture. The severity and frequency of drought could be increased in the Great Lakes-St. Lawrence and Prairie regions. In addition, the greater variability in weather conditions could affect crop growth.

How successful countries are in adapting to climate change will determine their future comparative advantage in agriculture. (UNEP, 1989)

Tactical Adaptation Measures

2.1.1 Alter Agricultural Practices to be More Tolerant of Climate Change

Encourage agricultural practices that anticipate the advent of and are more tolerant of climate change.

Background

Adoption of some crop types may reduce the vulnerability to stress of summer heat and dryness (UNEP, 1989). It has been estimated that in the major Canadian grain-growing provinces, selection of different cultivars would almost eliminate crop losses from warming due to a doubling of atmospheric CO₂ concentrations (Arthur *et al.*, 1986). It has been argued that the expansion of hard red winter wheat between 1920 and 1980 across spatial climate gradients that exceed the climate change expected from a doubling of CO₂ concentrations is the result of the development of new cultivars and new cultural practices (Easterling 1988). Practices such as more tillage and pre-planting activities might be done in the fall when it is drier. Earlier planting and lower plant densities may offset heat and moisture stress during warmer and possibly drier. Earlier planting and lower plant densities may offset heat and moisture stress during warmer and possibly drier summers. (UNEP 1989)

Objective

To develop agricultural practices and operations which are more climate tolerant to ensure success of agricultural industry.

ADAPTATION MEASURES

Action

Specific actions would include, but are by no means limited to the following:

- Choose climate tolerant crops
- Adjust the timing of agricultural operations
- Choose from a range of farming practices, i.e., minimum tillage, conventional bare fallow, contour cropping, avoid monocropping etc.
- Change land topography to reduce runoff and improve water uptake
- Introduce systems to improve water use efficiency
- Encourage operational improvements to agricultural operations such as; leak detection and repair, adoption of soil moisture monitoring and irrigation scheduling techniques on high volume users (i.e., sod farms), prohibiting agricultural drainage of significant wetlands, controlling agricultural land drainage so that more water will infiltrate into the ground instead of running off rapidly, biological pest control to reduce the amount of water used in chemical application, land practices which will reduce runoff and increase water uptake, the introduction of farm ponds for farm-use self-sufficiency
- Encourage new agricultural operations in areas which are not as sensitive to climate change.

Strategic Adaptation Measures

2.1.2 Eliminate Inappropriate Government Programs

Review government assistance and subsidy to the agricultural sector with the objective of increasing the adaptive ability of agriculture to anticipated atmospheric changes.

Background

It is suggested that one of the reasons agriculture is not more adaptable to variations in climate is because of government subsidies and programs which in effect lessen the risk of farming in marginal climates. These programs actually act as disincentives to adapt to climate change and may no longer be realistic

Before 1976, the trend in prairie farms was for mixed commodities, with cattle supplementing and complementing grain production. High grain prices in the mid-seventies and elimination of Wheat Board quotas encouraged specialization in grain production. A return to mixed agriculture would provide resilience to factors, such as climate change.

Objective

To examine the nature of government programs that alter farmers perceptions of risk by providing relief or other subsidies.

Precedents

The Government of New Zealand has reduced the amount of relief compensation over the period of 1986 to 1989. Farmers adjust immediately to climate variability. This has resulted in about a 10% loss in agricultural operations. These cuts were thoroughly researched and the adjustment has been relatively smooth, although not popular within the agricultural sector.

The Government of Australia has also reduced agricultural subsidies and has instead focused attention on rural adjustment to move people off the land where it is not profitable, or move people into agricultural industries that are profitable. As a result, areas sown in wheat have fallen into line with the decreasing return. The alternative in Australia to wheat is to seed wheat land to grass and switch to livestock (Crerar 1991).

Considerations

Canada may not have the production flexibility that Australia and New Zealand. This may restrict policy options.

An alternative to investigate is to develop insurance policies which encourage adaptive measures, i.e., lower premiums for agricultural operations minimizing erosion and maximizing ground water recharge.

2.2 WATER RESOURCES SECTOR ADAPTATION MEASURES

Canada's per capita water use is the second highest in the world. Because of this high demand, municipal water use is becoming one of the most critical water issues in Canada (SOE Bulletin, 1994). Municipal water shortages can be attributed to; unrestricted use, increasing populations, inadequate delivery systems, land use practices in water catchment areas, periodic drought conditions, and low water prices.

It has been estimated that as much as a 30% savings of water can be realized by the introduction of water saving devices or water efficient technology into residential settings. These technologies include such devices as water saving shower heads and low water use toilets. Use can be voluntary, encouraged by economic incentives (full cost pricing) or legislated for new construction through building codes.

ADAPTATION MEASURES

Tactical Adaptation Measures

2.2.1 Increase Water Use Efficiency

Begin immediately to implement programs directed to using water efficiently in all sectors.

Objective

To increase water use efficiency in all new and existing residential settings.

Action

Specific actions may include;

- Incorporating water efficient technology into building codes
- Encourage water efficient renovations in existing homes
- Introduce full or marginal cost pricing for water supply
- Privatize water utilities to facilitate full cost accounting.

Precedents

The Regional Municipality of Waterloo is investigating different efficiency initiatives in an attempt to assemble a strategic plan for water efficiency.

Strategic Adaptation Measures

2.2.2 Expand Property Rights to Water, Including a Mechanism for Trading Water Rights or Entitlements

Encourage land owner responsibility for water by expanding property rights.

Objective

To encourage land owner responsibility for water supply and quality.

2.3 FORESTRY SECTOR ADAPTATION MEASURES

Forestry is a major sector of the Canadian economy. In 1990 it accounted for \$22 billion in exports and \$43 billion in GDP. Forests are sensitive to climate, particularly the boreal forest which represents 82% of the total forested area. (Smit, 1993)

The forestry sector is particularly vulnerable because of the long life spans or turn around cycles (50 to 200 years) and the relatively low levels of management input. Climate-related factors such as fire, insects and disease play key roles in the health of existing stands and in restocking. The industry may also be affected through climate-induced changes in the viability of winter harvesting and transportation

Tactical Measures

2.3.1 Reduce Vulnerability of Forestry Operations to Climate Change

Promote enhanced forestry operations to reduce the anticipated risks of climate change.

Objective

To alter forestry operations to reduce the vulnerability to the impacts of climate change and variability.

Action

Specific actions could be as follows:

- Plant fire and climate change resistant species
- Use shorter rotation options to reduce risks during life span of forestry crops
- Establish and maintain fire control corridors
- Enhancing fire fighting capabilities.

Strategic Measures

2.3.2 Identify and Eliminate Inappropriate Economic Incentives and Subsidies in Forestry

Review current subsidies and support to the Forest Sector with the objective of understanding how these inhibit the adaptive ability of the sector to anticipated climate change.

ADAPTATION MEASURES

Measure F5 which proposes reviewing all federal and provincial subsidies in key sectors, will identify subsidies and estimate the impact of their removal on GHG reduction. Further work is required to identify the barriers to adaptation which these subsidies pose, and the heightened ability to adapt to climate change which their removal will provide.

2.4 HAZARD AND COASTAL ZONE MANAGEMENT SECTOR ADAPTATION MEASURES

A population of just over 2 million, or one quarter of Atlantic Canada's population, live in the 1,300 coastal communities. These communities depend on the fisheries, marine transportation, energy development, coastal infrastructure and tourism and recreation industries.

Sea level rise (SLR) as a result of climate change threatens both human and natural systems in coastal areas. Estimates of global mean sea level rise range from 0.5m to 2.0m by the year 2100 depending on the source used (Edgerton, 1991). The amount of sea level rise is also region specific depending on the regional rates of subsidence or uplift in the coastal area. The impact of these changes are not well understood in Canada as only a few impact studies have been completed. In the Arctic area, changes in sea level are already threatening coastal communities.

The anticipated issues arising as a result of SLR on the coastal areas are as follows:

- Inundation or flooding of new areas;
- Changed erosion regimes;
- Threatened the viability of natural resources such as wetlands;
- Increased risk to hazardous waste facilities;
- Decreased ground water quality as a result of salt water intrusion.

Reducing the impact of these changes require both structural and non-structural solutions for both the natural and human activities that take place in the coastal areas.

Tactical Measures

2.4.1 Enhance Land Use Regulations in Coastal and Hazard Zones

Promote enhanced land use regulations in coastal and climate hazard zones to increase the adaptive capabilities of these areas to anticipated climate change.

Objective

To minimize damage in coastal and hazard areas resulting from climate change scenarios.

Action

Actions in this regard could be as follows:

- Strengthen land use planning measures to prevent or discourage construction within flood plains, exposed coastal sites and other hazardous locations.
- Create erosion-based setbacks in regional planning to mitigate the effects of erosion.
- Establish building codes and size restrictions for dwellings near the coastal areas.
- Restrict new infrastructure and flood insurance availability to areas to be defined as high risk, and allow no federal subsidies or insurance in those areas.
- Establish post-storm reconstruction restrictions on buildings in excess of 66% destroyed during storms.

Strategic Measures

2.4.2 Establish a Federal Coastal Defense Agency

Establish a Federal Coastal Defence Agency to research and educate on the anticipated hazards and adaptive measures for coastal areas under climate change scenarios.

Objective

To reduce the impact of hazards in coastal areas through coordination and research.

Action

Actions in pursuit of this objective could be as follows

- Organize and create the Federal Coastal Defense Agency responsible for coordinating programs to help reduce the impacts of SLR and natural hazards in coastal areas.
- Establish research programs to determine where coastal areas are susceptible to SLR and storms.
- Initiate education and information programs to provide information on the realities of SLR and risk assessment of areas where it is most critical.

2.5 URBAN INFRASTRUCTURE AND CONSTRUCTION INDUSTRY ADAPTATION MEASURES

The construction industry is one of Canada's largest industries. The costs for construction are notoriously affected by weather and climate (Smit, 1993). This is the International Decade for Natural Disaster Reduction (IDNDR); the need for Environment Canada to address Canadians' abilities to deal with, or adapt to, natural disasters is increasing. Some areas of urban infrastructure are successfully adapted to today's climate in terms of ensuring safety, however the potential future change in the climate creates a greater range of uncertainty in the size and distribution of climate related hazards.

The issue of climate change and building codes can be separated into two categories according to the importance and life cycle of the structure: 1) critical and long term structures such as hazardous waste facilities and fixed links, and 2) those which are short life and are not critical to the community. In regard to reducing the impact of climate change on structures it is necessary to ensure that the current system to update climate trends by region is continued, and that the uncertainty of the climate change scenarios are incorporated into the design and building of the critical structures that may threaten the health of the community.

Tactical Measures

2.5.1 Enhance Building Codes

The federal government will establish new Building Code guidelines to anticipate and adapt to climate change scenarios.

It is expected that Building codes can be modified to adapt to new climatic factors including:

- Changes in the geographic distribution, frequency and intensity of severe storms such as tornadoes, hurricanes and blizzards;
- Seasonal temperature changes that would influence the power demands and consumption rates for heating and air-conditioning;
- Changes in precipitation and run-off that would have an impact on municipal storm systems.

Strategic Measures

2.5.2 Develop Economic Incentives to Encourage Energy Efficient and Climate Tolerant Structures

Promote energy efficient construction as a climate change issue not only as a mitigation measure but also as an adaptation measure.

- Encourage cost sharing programs where private renovations company oversees renovations at it's own cost and in return, receives the savings on energy billings over the next five years.
- Educate architects and engineers on energy efficient construction.

ADDENDUM TO APPENDIX A

(Modifications to Measures for Modelling Scenarios)

RESIDENTIAL - NEW

1.1 NATIONAL BUILDING ENERGY EFFICIENCY CODE

All relevant jurisdictions would voluntarily integrate the National Energy Code for Houses (NECH) into their building codes, effective 1996, and would move to a more stringent version, equivalent to the R-2000 standard, effective 2001.(already in baseline projection).

Those cities that have committed to limiting greenhouse gas emissions (representing roughly 20% of new houses built each year) would voluntarily move to a more stringent version of the NECH, equivalent to the R-2000 standard, effective 1996, and would move to a code, equivalent to efficiency levels associated with the Advanced House, effective 2001.(incremental aspect of 1.1)

Energy departments would assist this process through the development and provision of technical, information and training tools.

1.2 ENERGY EFFICIENCY MORTGAGES

1.3 NATIONAL HOME ENERGY RATING SYSTEM (HERS)

1.4 NATIONAL BUILDER TRAINING PROGRAM

Under a “low” scenario, about 3% of new homes each year would be built to the R-2000 level prior to 2001 (instead of to NECH levels) and to the Advanced House level post 2000 (instead of to the R-2000 level) in response to the development and implementation of a financing mechanism facilitated by governments but delivered by the private sector, without government subsidy, through mortgages for new homes.(1.2)

In a “high” scenario, the proportion of new homes effected would be higher (i.e. 5% per year) as governments also develop and implement supporting HERS and training programs.(1.2, 1.3, 1.4)

RESIDENTIAL - RETROFIT

1.5 NATIONAL LOW INCOME ENERGY EFFICIENCY RETROFIT PROGRAM

1.10 RENOVATION/RETROFIT TRAINING PROGRAM

Houses covered under the existing Residential Rehabilitation Assistance Program would be retrofitted (about 11,000 per year). Under a “low” scenario, envelope and water heating efficiency would be improved by 10%.(1.5)

Under a “high” scenario, the improvement in envelope efficiency would be 12% (instead of 10%) as governments also develop and implement a supporting Renovation/Training Program.(1.5, 1.10)

- 1.6 RETROFIT BUILDING STANDARDS
- 1.7 ENHANCED FINANCING MECHANISMS
- 1.8 NATIONAL HOME ENERGY RATING SYSTEM (HERS)
- 1.10 RENOVATION/RETROFIT TRAINING PROGRAM

Relevant jurisdictions, representing about two-thirds of existing housing, would voluntarily establish building standards for “designated” renovations, requiring them to meet the NECH of the day. “Designated” renovations would equal about one-third of annual renovations. There would also be a requirement to upgrade water heating efficiency. (1.6)

Under a “high” scenario, the provision of supporting government programs (i.e. Financing Mechanism, HERS and Training Program) would result in jurisdictions representing 98% of existing housing to establish retrofit building standards and to apply them to roughly one-half of annual renovations. (1.6, 1.7, 1.8, 1.10)

- 1.7 ENHANCED FINANCING MECHANISMS
- 1.8 NATIONAL HOME ENERGY RATING SYSTEM (HERS)
- 1.10 RENOVATION/RETROFIT TRAINING PROGRAM

Under a “low” scenario, about 2% of all existing houses would be retrofitted each year in response to the development and implementation of a financing mechanism facilitated by governments but delivered by the private sector without government subsidy. Building envelope and water heating efficiencies would be improved by 10%. (1.7)

In a “high” scenario, the proportion of existing homes effected would be higher (i.e. 2.5% per year) and the efficiency improvement greater (i.e. 15% envelope improvement) as governments also develop and implement supporting HERS and Training programs.(1.7, 1.8, 1.10)

COMMERCIAL - NEW

2.2 NATIONAL ENERGY CODE FOR NEW COMMERCIAL BUILDINGS

All relevant jurisdictions would voluntarily integrate the National Energy Code for Buildings (NECB), equivalent to ASHRAE 90.1, into their commercial building codes and would move to more stringent levels over time (already in baseline projection).

Those cities that have committed to limiting greenhouse gas emissions, representing roughly 50% of new commercial buildings each year, would voluntarily accelerate their adoption of the more stringent levels, moving to higher levels five years earlier than anticipated above.(new aspect of 2.2).

Energy departments would assist this process through the development and provision of technical, information and training tools.

- 2.3 ENERGY EFFICIENCY MORTGAGES
- 2.4 NATIONAL BUILDER TRAINING PROGRAM

Under a “low” scenario, about 3% of new commercial buildings each year would be built to levels more stringent than the prevailing NECB in response to the development and implementation of a financing mechanism, facilitated by governments, but delivered by the private sector, without government subsidy. (2.3)

In a “high” scenario, the proportion of new commercial buildings effected would be higher (i.e. 5% per year) as governments also expand supporting builder training programs.(2.3, 2.4)

COMMERCIAL - RETROFITS

- 2.5 RETROFIT STANDARDS
- 2.6 FINANCING MECHANISMS
- 2.7 NATIONAL BUILDER TRAINING PROGRAM

Energy efficiency standards, equivalent to the NECB of the day, would be developed for “major” renovations of commercial buildings. All jurisdictions would voluntarily adopt the code, so that, by 2000, about 9% of the 1995 existing building stock would undergo renovations that would be required to meet efficiency levels equivalent to the NECB of the day. By 2010, 23% of the existing 1995 building stock would be effected.(2.5)

Under a “high” scenario, the percentage of 1995 existing building stock effected would be higher (13% by 2000; 35% by 2010) due to supporting government programs (i.e. enhanced financing mechanisms and expanded training programs).(2.5, 2.6, 2.7)

- 2.6 FINANCING MECHANISMS
- 2.7 NATIONAL BUILDER TRAINING PROGRAM

Under a “low” scenario, about 7% of the 1995 existing commercial building stock would be retrofitted by 2000 (27% by 2010) in response to the development and implementation of a financing mechanism facilitated by governments but delivered by the private sector without government subsidy. Buildings would be retrofitted to efficiency levels equivalent to the NECB of the day.(2.7)

In a “high” scenario, the proportion of 1995 existing commercial building stock effected would be higher (9% by 2000; 33% by 2010) as governments also expand supporting training programs.(2.6, 2.7)

- 2.8 FEDERAL BUILDINGS INITIATIVE

The Federal Buildings Initiative (FBI) is a voluntary measure based on promotion,

education and training, and administrative and technical assistance. It employs Energy Performance Contracting to finance and implement energy management projects in federal buildings. An expanded FBI (which includes replication by other government jurisdictions) is projected to affect 42% of federal, provincial and municipal government-owned buildings by 2010 and to achieve an average of 15-20% energy savings per retrofitted building.

2.9 ENERGY INNOVATORS PROGRAM

The Energy Innovators Program is designed to mobilize corporations across Canada to undertake energy efficiency measures in their facilities through non-binding "partnership" agreements. It is a voluntary measure based on promotion, education and training, and administrative and technical assistance. It facilitates the use of Energy Performance Contracting to finance and implement energy management projects. An expanded Innovators Program is projected to affect, by 2010, 42% of the retail and hospitality sectors and 60% of the remainder of the private commercial sector. It would achieve an average of 15-20% energy savings per retrofitted building.

INDUSTRY

3.1 EFFICIENCY INDICATORS

3.2 BENCHMARKING/BEST PRACTICES

3.3 INDUSTRIAL ENERGY INNOVATORS PROGRAM

Industry would set more aggressive targets for energy intensity improvements (which in conjunction with the current CIPEC program would realize nearly 50% of the estimated economic potential in the industrial sector). The setting and realization of these targets would be supported by the Benchmarking/Energy Practices and Industrial Energy Innovators programs which will facilitate the conducting of energy audits, the establishment of implementation plans and technology transfer.(3.1, 3.2, 3.3)

3.4 ELECTRIC DRIVEPOWER CHALLENGE

Drivepower manufacturers, industrial energy users and electric utilities would work together to increase the market penetration of efficient industrial electric drivepower systems, realizing about 25% of the economically attractive energy efficiency potential in this area. The program would use a Showcase Demonstration competition in the context of a national marketing effort.

3.6 TAX INCENTIVE FOR ENERGY EFFICIENT INDUSTRIAL PROCESS INVESTMENTS

A tax incentive would be provided that would effectively reduce by 10% the capital costs of the more efficient industrial process technologies available in the marketplace.

APPLIANCES AND EQUIPMENT

- 4.1 STANDARDS FOR APPLIANCES AND EQUIPMENT
- 4.2 LABELLING FOR APPLIANCES AND EQUIPMENT
- 4.3 GOLDEN CARROT PROGRAM

Standards for appliances and equipment would be made more stringent over time so that they approximate "optimal economic" levels for Canada and/or levels in place or proposed in the United States.(already in baseline projection)

A Golden Carrot initiative would commence for refrigerators and freezers in 1999 with the resulting more energy efficient models becoming the market standard by 2007. (4.3)

VEHICLE EFFICIENCY

- 5.2 NATIONAL INSPECTION AND MAINTAINANCE (I&M) PROGRAM

The I&M Program would be implemented in Toronto, Montreal and Vancouver where inspections would be required every year at licensed private stations and on change of registrations. In response, about 40% of vehicles covered by the Program are projected to tune-up their vehicles either in anticipation of the test or after failing the test. These tune-ups would result in a 10% fuel efficiency gain per vehicle effected.

- 5.5 VEHICLE SCRAPPAGE PROGRAM

Financial incentives would be offered in 1995/96 for the scrapping of pre-1977 automobiles and light trucks, resulting in the scrapping of 92% of such vehicles.

- 5.8 FUEL EFFICIENCY STANDARDS FOR NEW VEHICLES

The federal government would negotiate with vehicle manufacturers higher voluntary fuel efficiency standards commencing in the year 2000. It is projected that the standard, which is currently 8.6 litres per 100 kilometres would be revised to: 7.8 litres/100 km in 2000; 7.3 litres/100 km in 2005 and 6.8 litres/100 km in 2010.

- 5.11 VEHICLE EMISSIONS LABELLING PROGRAM

A mandatory vehicle emissions labelling program, supplemented by a government-led education/public information program, would result in purchasers of light-duty vehicles selecting more fuel efficient vehicles within the same price categories and vehicle class.

URBAN TRANSPORTATION

For the urban transportation measures (5.14 to 5.19), the following general implementation scenario was assumed:

- prior to 2000, implementation begins in Tier I cities (i.e. Toronto, Montreal and Vancouver);
- from 2000 to 2005, implementation begins in Tier II cities (i.e. Calgary, Edmonton, Ottawa and Winnipeg) and is strengthened in Tier I cities; and
- from 2005 to 2010, implementation begins in remaining urban areas and is further strengthened in Tier I and II cities.

This reflects the time required to overcome current institutional, political, technological and funding barriers.

5.14 TELECOMMUTING AND ALTERNATIVE WORK STRATEGIES

Governments would promote telecommuting, compressed work weeks and variable work hours through information programs, public sector demonstrations and legislative changes (trip reduction ordinances, revised by-laws governing work-at-home).

This would lead to reduced peak-period travel and congestion and, in some cases (e.g. where neighbourhood “telework” centres are established), to decreased average trip lengths. There would be a negative effect on transit usage (since, in most places, off-peak transit service is not as frequent or convenient as peak hour service).

5.15 IMPROVE CYCLING AND WALKING ENVIRONMENT

Cycling and walking would be facilitated and promoted through employee education, financial support (for bicycle support facilities and for redesigning bicycle routes) and legislative changes (e.g. to require new developments to provide bicycle support facilities).

This would lead to a modal shift in favour of biking and walking. There would also be an increase in trip activity with some spill-over effect to the mechanized modes (e.g. higher transit usage due to better bike-transit integration). This measure assumes no effect on trip lengths.

5.16 INCREASE TRANSIT RIDERSHIP

There would be an increase in transit ridership in the larger urban areas due to improved transit management and capital improvements. It is assumed that the capital funding contemplated under this measure would allow for modest fleet expansions and small capital improvements (e.g. park ‘n’ ride lots, expanded stations, queue-jumping lanes at intersections) and not large transit mega-projects.

There would be an increase in transit’s share of total urban travel by 25% in the three

largest cities, 20% in the intermediate cities, and 10% in the tier-III cities. There would be a nominal increase in travel activity and a small increase in average transit speeds.

5.17 PROMOTE RIDESHARING

The formation of carpools and vanpools would be encouraged through dedicated High Occupancy Vehicles (HOV) facilities and formal ridesharing programs.

There would be an increase in average auto occupancy and an increase in average speeds in the more congested urban centres. There would also be some increase in auto travel and some switching to autos by existing transit riders.

5.18 ROAD PRICING

Road pricing would be used to increase the cost of single-occupancy-vehicle driving. It is assumed that this measure would be primarily driven by high levels of congestion. Thus, it is assumed that for the year 2000, road pricing would be limited to the Highway 407 system in Toronto and to a few demonstration projects at key entrances to the downtown cores of Toronto, Montreal and Vancouver. For the year 2005, there would be full congestion-pricing schemes around the central areas of tier-III cities, with selected applications of congestion-pricing technologies in the tier-II cities. No road pricing is applied to the tier-III cities.

The result would be a reduction in travel activity; a switch from autos to other modes or ridesharing; and an increase in average network speeds. In some cases, there would be a reduction in trip lengths; in other cases there would be an increase.

5.19 FULL-COST PARKING AND PARKING MANAGEMENT

Governments would make changes in taxation policy; require full-cost pricing of parking and amend building codes/local zoning by-laws to reduce the number of car parking spaces required for each development. This would result in higher parking charges and a reduced supply of parking spaces.

As a result, travellers would forego, combine or defer trips, use an alternative mode, or rideshare.

INTER-CITY TRANSPORTATION

5.22 REGULATE HIGHWAY SPEED

Governments would lower the speed limit to 80 kilometres per hour on all major highway systems and would strictly enforce these limits. This would result in a reduction in the average speed on major highway systems from 110-120 km/hr to 80-90 km/hr.

APPENDIX B
IMPACTS OF MEASURES
(NOTIONAL)

APPENDIX B

SECTORS & MEASURES	JURISDICTION F = Fed P = Prov M = Munic PS = private sector	GHG REDUCTION (Tonnes CO ₂ equiv) 1995-2000	FISCAL COSTS 1995 - 2000			PRIVATE SECTOR and UTILITIES 1995 - 2000		FEASIBILITY* Ranking 1 to 5 (easy to very difficult)
			Fed	Prov	Munic	Invst. Costs	Energy Savings	
Residential								
1.1 EE Code								
1.2								
1.3								
1.4								
1.5								
1.6								
1.7								
1.8								
1.9								
1.10								
Commercial								
2.1								
2.2								
2.3								
2.4								
2.5								
2.6								
2.7								
2.8 (cont'd.)								

* see Principles & Criteria

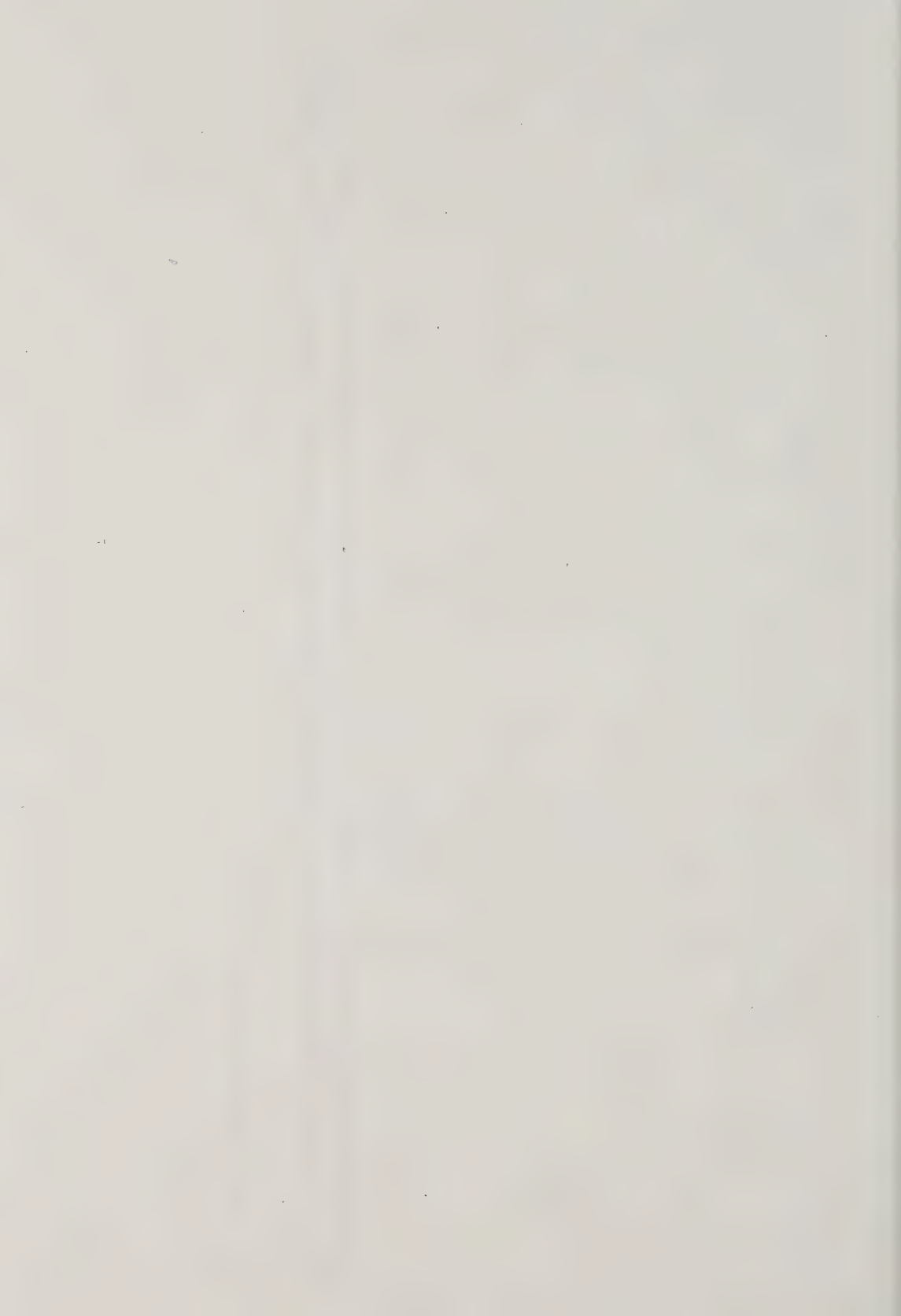
APPENDIX C

**IMPACTS OF PACKAGES OF MEASURES
(NOTIONAL)**

PACKAGES OF OPTIONS FOR GHG EMISSIONS STABILIZATION BY 2000

Similar tables for other packages to be added.

Similar tables for other packages to be added.



APPENDIX D

EMISSIONS OUTLOOK SUMMARY

Energy Related GHG Emissions Projection for Canada - An Update

Introduction:

In September 1993, Natural Resources Canada released its long term projections of energy demand, supply and related greenhouse gas (GHG) emissions in a document entitled Canada's Energy Outlook: 1992-2020 (CEO). These projections were subsequently incorporated in Canada's National Report on Climate Change.

This note provides an update to the earlier projections, reflecting the impact of recent developments and changing perspectives on energy matters. The Update was requested by the National Air Issues Coordinating Mechanism (NAICM) in order to provide a current baseline against which to develop the National Action Program to achieve Canada's climate change objectives.

In developing the projection of energy related emissions of GHGs, NRCan has consulted with experts in both the private and public sectors. We would particularly wish to thank the members of the Canadian Emissions Modelling Forum, the Canadian Industry Program for Energy Conservation and the Canadian Petroleum Products Institute for their valuable comments.

The updated reference case forecast of GHG emissions from energy, under "business as usual" assumptions, is 568 megatonnes (MT) of CO₂ equivalent in 2000 and 619 MT in 2010. This compares with our forecasts of 559 MT and 663 MT in respective years, in the CEO. Relative to 1990 GHG emissions of 506 MT, the new forecast implies a "gap" of 62 MT in 2000, versus 53 MT reported in the CEO document. (The growth in CO₂ emissions accounts for 57 and 49 MT , respectively). This "gap" approximates the challenge to be bridged through new government policies, if GHG emissions are to be stabilized at 1990 levels¹.

¹ Canada's commitment to stabilize emissions of greenhouse gases by 2000 applies to emissions from all sources of the economy, including energy combustion which represents 91% of the total emissions in 1990, excluding emissions from CFCs. Actions to reduce non-energy GHG emissions, or increase sinks of GHG can and will contribute to Canada's objective.

A brief description of the assumptions underlying the major changes in this update and their implications for the estimate of GHG emissions are provided below.

Macroeconomic Assumptions:

The updated projections incorporate a more recent version of Informetrica's forecast (December 1993) of Canada's macroeconomic performance. The new forecast of economic growth at 2.8%/year for 1991-2000 is higher than the 2.5%/year growth rate used in the CEO (see the attached chart 1). The principal rationale for the increase is a lower exchange rate forecast (85 cents in the CEO to 76 cents in the Update). Other factors are NAFTA, better than expected improvements in productivity in the manufacturing sector (due to restructuring by firms), stronger investment in machinery and equipment and finally better net export performance.

For the period beyond 2000, Informetrica has lowered its forecast of national income (real domestic product – RDP), reflecting weaker demand for consumer durables and investment in machinery and equipment. The principal external factor responsible for lower Canadian economic growth is the slower growth in the U. S. The revision also reflects the comments from Informetrica's consultation process.

Informetrica's recent macro forecast is in line with other projections (chart 2). For the most part, the manufacturing industry is comfortable with the forecast. However, based on comments from Industry Canada and the members of the Canadian Industry Program for Energy Conservation, NRCan has, however, lowered Informetrica's RDP growth rates for the iron and steel and chemical industries for 1994-2000.

Energy Prices:

World oil prices have been revised down to US\$20-22/bbl over the forecast period, a reduction of about US\$1.50-\$2.50/bbl. Even with this downward revision, our prices are higher than those projected by some consultants such as Petroleum Economics Ltd and Petroleum Industry Research Associates, but lower than the U.S. Department of Energy (DOE) and the International Energy Agency (chart 3).

The lower exchange rate partly offsets the impact of reduced international prices on Canadian energy prices. Domestic oil prices are projected to be about 5-7% less in the Update than in the CEO over the forecast period (chart 4). Prices of natural gas, electricity and coal are similar to those in the CEO.

Automobile Fuel Efficiency Program:

The CEO had incorporated significant improvements in fuel efficiency for new cars at the rate of about 3%/year from 1996 to 2001. This view was based on the assumption that the U.S. government would mandate a tightening of its Corporate Average Fuel Efficiency (CAFE) standards. It now seems increasingly unlikely that the U. S. will introduce such an initiative in this decade. The question which remains is what degree of automobile improvement is likely to occur in the absence of regulatory pressure. Although there is considerable uncertainty on this point, the answer appears to be very little. The Update assumes fuel efficiency improvements of 0.4%/year, reflecting autonomous efficiency improvements. This rate is similar to the U. S. DOE recent forecast for the U. S.

Mothballing of One Unit of Bruce 2:

Power generation from this unit was included in the CEO, but Ontario Hydro has now decided to mothball it in October 1995 in an effort to reduce operating costs. To deal with this loss of electricity generation, Ontario Hydro has indicated that it could use a combination of reduced electricity exports, more coal, more non-utility generation (i.e. gas) and more demand side management.

Revised CO₂ Equivalencies for Methane and N₂O:

The Intergovernmental Panel on Climate Change is in the process of revising its CO₂ equivalencies for methane and nitrous oxide (N₂O). It considers now a global warming potential (GWP) of 20-43 for methane and 330 for N₂O as more appropriate than 11 and 270 used previously, based on further scientific studies. NRCan has decided to apply GWPs of 22 for methane and 330 for N₂O in our both revised and previous outlooks. These factors were also applied by the U. S. in its action plan.

Key Results:

The sources of the 9 MT increase in the gap (from 53 MT as reported in the CEO to 62 MT as estimated now) for 2000, are presented in Chart 5. Higher economic growth and the mothballing of the unit of Bruce 2 are major contributors to the increase, at 4.5 MT and 3 MT respectively. Lower automobile efficiency makes up 1.5 MT.

In contrast to slightly higher forecast of emissions for 2000, the projection for 2010 is now lower than in the CEO (Chart 6). NRCan is projecting an increase of 113 MT of energy related GHG emissions by 2010 from the 1990 level, compared to 157 MT in the CEO. This reduction is due primarily to lower economic growth, in particular lower industrial RDP, less sales of road vehicles and reduced air travel and cargo than those assumed in the CEO.

Based on the revised macro and price scenario, the impact of energy efficiency initiatives were reviewed which resulted in a greater impact. The changes in the impact assessment are mainly due to more up-to-date information on, and greater experience with, the initiatives. For example, tighter equipment standards and building codes are now expected, and the energy innovators program is anticipated to have a greater impact than envisaged in Canada's Energy Outlook.

In addition to the lower energy demand forecast, the other factor responsible for reducing GHG emissions between 2000-2010 is the retirement of some coal plants (which will have passed their economic lives), de-mothballing of the Bruce 2 unit in 2003 and additions of hydro plants to meet new electricity demand.

Conclusions:

While there are some differences between this Update and the earlier projection of GHG emissions, the message is essentially the same. In the absence of policy changes, GHG emissions will likely continue to increase over the next 15 years or longer. Attaining the stabilization goal by the year 2000 is possible, but will require some significant policy initiatives, as the Draft National Action Program shows. Reducing the emission level beyond 2000 poses a major challenge.

The projected level of energy related GHG emissions is very sensitive to the evolution of a variety of market forces, affecting energy demand and supply. For example, by 2010 the updated forecast of GHG emissions is about 7% lower, principally as a result of a relatively small change in the level of economic activity. Furthermore, as GHG emissions targets are established with reference to the 1990 level, the projected size of the "gap" can change rather substantially for modest changes in macroeconomic, energy efficiency and fuel price assumptions.

CHART 1

ECONOMIC PROSPECTS:

Update 94 vs CEO Projection

	1991-2000		2000-2010	
	CEO	94 Update	CEO	94 Update
	Average Annual Growth Rates (%)			
<i>Total GDP</i>	2.5	2.8	2.5	2.2
<i>Industrial GDP</i>	3.2	3.7	3.2	2.5
<i>Service GDP</i>	2.2	2.4	2.2	2.1
<i>CPI</i>	2.8	2.0	2.8	2.0
<i>Exchange Rate</i>	0.85	0.76	0.85	0.76
<i>Interest Rates</i>	6.5 (2000)	6.3 (2000)	5.9 (2010)	5.9 (2010)

Source: Informetrica's Winter 1993 Projection

CHART 2

COMPARISON OF CANADA'S MACROECONOMIC PROJECTIONS:

1991 to 2010

Average Annual Growth Rates (percent)

	<i>Informetrica</i>	<i>WEFA</i>	<i>DRI</i>
<i>RDP</i>	2.5	2.6	3.0
<i>Households</i>	1.6	N/A	1.5
<i>Labour Force</i>	1.2	1.3	N/A
<i>Unemployment Rate (percent in 2010)</i>	9.6	7.2	7.8

CHART 3

WORLD OIL PRICES

Comparison of Forecasts (WTI at Cushing, 1993US\$ /bbl)

	<i>1995</i>	<i>2000</i>	<i>2005</i>	<i>2010</i>
<i>PEL</i>	18.5	18.5	-	-
<i>PIRA</i>	18.0	18.4	18.4	-
<i>IEA (1994)</i>	17.8	24.1	29.3	29.3
<i>US DOE - Ref.</i>	19.0	21.0	25.1	28.4
<i>CERI</i>	20.1	22.1	21.8	23.0
<i>DRI</i>	17.5	22.1	26.5	-
<i>NEB</i>	21.0	22.5	22.5	23.0
<i>NRCan - CEO</i>	21.0	22.5	24.0	24.0
<i>NRCan - 94 Update</i>	20.0	20.0	22.0	22.0

CHART 4

CANADIAN OIL PRICES: Cdn \$/BBI (\$1993)

Ontario Refinery Cost

	<i>1995</i>	<i>2000</i>	<i>2010</i>
<i>NRCan - CEO</i> Exchange Rate Cdn 0.85/\$U.S.	26.7	28.6	30.2
<i>NRCan - 94 Update</i> Exchange Rate Cdn 0.76/\$U.S.	25.7	26.4	28.9

CHART 5

CHANGES IN GREENHOUSE GAS* EMISSIONS

(Megatonnes of CO₂ Equivalent)

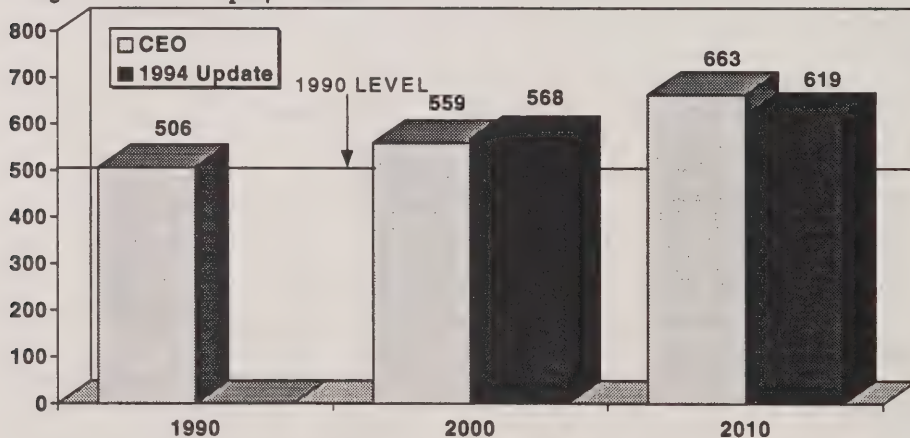
<i>CEO Emissions in 2000</i>	559
<i>Sources of Change</i>	
<i>Energy Prices</i>	0.5
<i>Macro (Economy, Demographics)</i>	4.5
<i>CAFE</i>	1.5
<i>Electricity Generation - Bruce Plant</i>	3
<i>Other (including methane adjustment)</i>	-0.5
<i>Update Emissions 2000</i>	568

* Energy Related Gases

CHART 6

GREENHOUSE GAS* EMISSIONS: CANADA

Megatonnes of CO₂ Equivalent



* Energy Related Gases

APPENDIX E

**THE VOLUNTARY CHALLENGE AND
REGISTRY PROGRAM**

The Voluntary Challenge and Registry Program

What is it?

A national program to challenge Canadian organizations to voluntarily reduce greenhouse gas emissions. It is a key element in Canada's plans to reduce its emissions of greenhouse gases.

Organizations will receive a written challenge from energy and environment ministers asking them to submit action plans on how they plan to reduce their emissions. A registry will be established to record those plans and the reductions that are achieved. This public record of plans and achievements can be used to recognize organizations for their efforts and, in cases where the reductions can be verified, could form the basis of future credit.

Who is eligible?

The challenge is directed towards private and public organizations in Canada. These organizations include all Canadian businesses and corporations and all levels of government. Organizations can make arrangements with other parties to submit an action plan. All parties would have to be identified and a reporting mechanism would need to be established. Organizations could also pool the efforts of individuals who could not achieve the minimum threshold level.

The minimum threshold for registering is 1000 tonnes of CO₂ equivalent net emission reductions for domestic action and 5000 tonnes of CO₂ equivalent for net reductions achieved outside Canada.

What activities are eligible?

Actions by organizations are eligible for registration if they:

- are designed to control greenhouse gas emissions;
- result in greenhouse gas emission reductions; or
- facilitate the sequestering of greenhouse gases through the development of sinks.

These activities can be part of your regular operations, pilot studies, prototype projects or demonstration projects. They can be defined at the corporate level, branch/plant level, community level, sector level or trade association level. Projects can take place on Canadian soil or at a foreign location.

All activities undertaken since 1990 to reduce net greenhouse gases are eligible for inclusion in the program.

Minimum standards for action plans will be developed in consultation with associations and other stakeholders.

How does the program work?

The program has three main components: Challenge, Recognition and Reporting.

The Challenge:

A letter from ministers of energy and environment will be sent to large organizations, public and private, asking them to voluntarily submit action plans to reduce their greenhouse gas emissions. A national registry will be established to accept and record these action plans.

Recognition:

All participants will be recognized according to their level of participation. Recognition could include:

- letters of congratulations;
- publication of names of participants; and
- licensed use of a "logo".

Reporting:

Some participants will be interested in receiving "credit" for their actions. Participants who provide firm commitments and achieve measured and verifiable reductions in their net emissions can have them formally recorded. Credit for these emission reductions will be considered if other measures in addition to the Voluntary Challenge are implemented in the future. This will help prevent the fear of being penalized for early action.

Organizations will report their activities to the national registry. Three levels of reporting will be established:

1. Expressions of interest, intentions and commitments.
2. Development and filing of action plans/MOUs.
3. Reporting of progress on implementation of action plans and actual net reductions on an annual basis subsequent to filing of initial action plan.

Guidelines with respect to reporting and recording of international projects and greenhouse gas sinks will be developed in consultation with associations and other stakeholders.

Why should you get involved?

This program can give your organization:

- a visible and credible vehicle to inform your customers or constituents about actions you are taking to address global climate change;
- a permanent record and credit for achievements in reducing greenhouse gases;
- a simple and straight forward method of participating in Canada's commitment to reduce greenhouse gases which is flexible, promotes least-cost actions and allows

private initiative; and

- a means of demonstrating how government and industry can work together to achieve public goals.

Why have a voluntary challenge program and a registry?

- encourage early action;
- provide examples of cost-effective actions;
- encourage private initiative and flexibility to identify and take win-win actions;
- recognize organizations that take up the challenge;
- provide a record of voluntary actions and net emission reductions; and
- provide a mechanism for assessing voluntary action and its contribution to Canada's climate change goals.

CA1
EP
1994
R25 Annex
1

Government
Publications

ANNEX 1

COMMENTS ON THE REPORT ON OPTIONS FOR CANADA'S NATIONAL ACTION PROGRAM ON CLIMATE CHANGE FROM INTERESTED PARTIES



Presented to the
LIBRARY *of the*
UNIVERSITY OF TORONTO
by
CIELAP

ANNEX 1



ANNEX 1

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ANNEX 1(A)

SUMMARY OF COMMENTS FROM REGIONAL WORKSHOPS ON DRAFT REPORT ON OPTIONS FOR CANADA'S NATIONAL ACTION PROGRAM ON CLIMATE CHANGE

Introduction

As part of the process of developing a National Action Program (NAP), the Climate Change Task Group (CCTG) contracted Price Waterhouse to undertake a number of public workshops across the country to solicit input on a draft Report on Options for Canada's NAP on Climate Change. These workshops provided stakeholders with an opportunity to review the draft document and provide perspectives on the requirements for a NAP. The workshops also provided for an exchange of ideas among participants through interactive working groups.

Workshop Objective

The primary objective of the workshops was to provide input specifically on the packages of measures developed by the CCTG. An Outreach Steering Committee comprised of members of the CCTG identified the priorities as getting specific feedback from interested parties on the measures to achieve emissions reductions. This primary objective served as the foundation for the workshop agenda.

Workshop Participants

Potential participants for the workshops were identified through a number of avenues.

- Individuals who had expressed interest in the Outreach through a response form enclosed in CCTG mailout entitled Building Canada's National Action Program on Climate Change.
- Provincial government representatives were invited to submit names of potential participants to augment the original response.
- Industry and environmental groups were also asked to review lists to ensure that all interested parties from their constituencies were included in an initial mailing.

Individuals or groups who were not originally on the potential participant lists were subsequently added to the list of attendees as they contacted either Price Waterhouse, the CCTG Secretariat, or other members of the CCTG. No individuals or groups were excluded.

Attendance numbers for each location were:

- Moncton: 25 participants and 9 observers;
- Montreal: 32 participants and 12 observers;
- Toronto: 62 participants and 17 observers;
- Calgary: 80 participants and 12 observers;
- Vancouver: 59 participants and 17 observers.

Common Themes

The detailed proceedings from each location are presented in individual reports. This section synthesizes some of the recurring common themes that arose at many of the locations across the country. It provides a synopsis of the major areas of common concern, interest, or perspective. This section is not intended to reflect the total breadth of perspective or input provided by workshop participants.

There were four primary areas of feedback. They related to:

- workshop format,
- workshop materials,
- questions on whether and how input will be used; and proposals on greenhouse gas reductions and the NAP.

The fourth area was the primary focus for the discussions and clearly had the largest selection of common themes. Each of these areas is discussed in subsequent sections.

Workshop Format

The feedback by participants on the format and execution of the workshops was generally very positive.

- Participants felt the workshops were well run and they were pleased that the sessions stayed on schedule.
- Participants were generally pleased with the break out groups and the ability to provide input and hear other perspectives.

- Participants were generally satisfied that they got a "fair hearing" and that their comments were recorded.
- The break out group topics and activities to start discussion were well received.
- Participants felt that the facilitators were fair and unbiased in their leadership.
- The process facilitators (both Price Waterhouse staff and others) were appreciated and made a positive contribution.
- Because numbers grew larger than had been anticipated and facilities were hard to get given the lead time available, the facilities were not ideal in most locations. This was particularly true during the breakout groups.

Workshop Materials

There was a general dissatisfaction with the material available for the workshops.

- Due to the tight time frames the materials (such as the Preliminary Draft Action Plan) were not received in sufficient time to allow some participants to review them in detail.
- Many participants found the Preliminary Draft NAP hard to follow and understand. This was especially true with those individuals with limited knowledge or background of the CCTG and the process to date.
- Participants were generally dissatisfied with the amount of analysis available. They found it difficult to make specific comment with respect to impacts in the absence of some analytical results on emissions reductions, costs, and economic impacts.
- Participants also wished to have more detailed discussion on the parameters of specific measures. It was difficult to make qualitative assessments of the impact of different measures in the absence of a firm understanding of how specific measures would be implemented in terms of application and intensity.

Use Of Input

There was some question among participants about the value of their input into the process.

- Some participants questioned the credibility of the Outreach given the lack of analytical results and the tight time frame to the November 8 Minister's meeting.

- There was some question regarding how the results/input coming from the individual meetings would be incorporated into the actual NAP document.
- Many participants thought there was value in hearing other perspectives and getting briefed on the information that was available.
- Participants were reminded of the provisions for submitting detailed individual responses directly to the Secretariat and many took advantage of that opportunity.

The NAP and Greenhouse Gas Reductions

Emissions Reductions

Emissions reductions were clearly seen as important given the charge from Ministers. There were a number of specific areas relating to emissions reductions:

- Emissions reductions need to be achieved in the context of the other criteria. That is the selection of measures to achieve the reductions should be based on their effectiveness and on their consistency with the other criteria/ principles.
- There was some concern with the 2000 deadline. The cost of meeting that deadline was considered by some to be unnecessary. They felt the deadline might bias the choice of measures and cause undue pain. Others, however, felt strongly that immediate action to the 2000 deadline was critical given the urgency of the problem and our commitments to 2000.
- There was general recognition that scenarios 1, 2, and 3 would be unlikely to get to the stabilization target. This was especially true as more information became available in later workshops. There was uncertainty with respect to the reductions achievable and the implementation of the measures. Some industry participants were less concerned about the emissions shortfall because of concern with respect to the economic impact of the measures identified.

Economic Impact

Economic impact was generally found to be the most important of the other criteria. There was some variation and disagreement with respect to this criteria.

- Measures should be selected to achieve reductions targets based on effectiveness and minimizing economic disruption or costs.
- There was disagreement on whether emissions reduction should override economic impact. Some argued that if the measures needed to reach emissions

reductions objectives were too disruptive, the objective would have to be moved back or abandoned or Canada would no longer be competitive or lose too much economic activity. Others argued that the objectives were clear and set in stone and that there may be some hard and bitter pills to swallow to achieve them.

- There was also no consensus on the degree to which the international context needs to be considered. Industry generally argued that the actions of our trading partners and competitors would have to be considered or Canada would merely export emissions and economic activity without reducing world emissions. Others argued that Canada had a role and a duty to be leaders in this area and that we should move forward despite differences with programs and measures in other countries.
- There was some disappointment that there did not seem to be consideration of the potential positive economic impacts associated with reductions generally and individual measures specifically. There was not felt to be an explicit acknowledgement of both positive and negative potential impacts.

Regional/Sectoral Fairness

Regional and sectoral fairness were generally thought of as secondary to emissions reduction and economic impact.

- While it is important to acknowledge and consider sectoral and regional impacts, fairness may not be possible while meeting the goals of effective and economically sensible/sound emissions reductions.
- It was generally felt that it is important to recognize that major contributors to emissions may have to bear a greater burden of reductions. Fairness may mean proportional reductions rather than equal reductions.

Comprehensive/Coherent Package

There was some concern regarding the packaging of measures. It was not clear how they had been packaged and why they were packaged that way.

- It was felt that the packages contained shopping lists *or* tool boxes of measures rather than coherent packages with logical ties.
- There was some suggestion that there was no clear connection between the measures and the principles. The analysis of measures with respect to emissions and economic impact might provide for repackaging of measures.

- The connections between measures seem to get lost across scenarios. Measures which may be complementary in some sectors or provide some sectoral balance are put into different scenarios causing concerns regarding how they will be implemented.
- It was generally felt that a coherent and understandable package was essential to get both stakeholder and broader popular "buy in." The participation and commitment of Canadians at large is critical for success and requires an understandable and credible package of measures.

Implementation

There was uncertainty with respect to the implementation and execution of the NAP and the measures in it.

- It was not clear, especially to industry participants, that the criteria were being applied in selecting measures. The absence of analysis makes it unclear that emissions reduction is being accomplished using cost effective/least disruptive measures.
- An explicit evaluation framework would increase the comfort with packages, although there is considerable disagreement as to what should be in the evaluation framework and the relative importance. The environmental groups are uncertain that the commitment to emissions reductions still is in place and becomes the primary objective. Industry wants explicit evaluation based on economic impact or costs.

Types of Measures (Voluntary, Regulatory, Market Mechanisms)

There was no consensus on the types of measures that should be used in achieving the emissions goals. In fact there was a clear division.

- The environmental groups and some other participants felt that a mix of mechanisms was the only way to achieve the desired reductions in the time given. Measures should be evaluated and selected based on potential effectiveness in achieving reductions for specific sectors or problems. There was concern with respect to the potential effectiveness of voluntary measures.
- Industry felt that a phased approach based on voluntary measures was preferable. Progress could be evaluated and other market or regulatory measures could follow if objectives were not met. Voluntary measures allow for flexibility in responding and for fine tuning later. Voluntary measures were also felt to provide the opportunity for setting higher targets than was the case with regulation.

- There was general agreement that voluntary measures need to have a safety net with teeth if objectives were not met.
- There was significant concern with respect to tax based measures given the current environment.

Time Lines

There was considerable discussion as to the 2000 deadline.

- There was some scepticism with respect to the 2000 date. Is it real and why? There was concern with the doability by 2000. Time is passing by. There was a clear feeling that we had to act quickly. What was not agreed was what to start with and how to proceed.

There were two other concerns with respect to the date.

- Some people feared that if too much emphasis was placed on 2000 some measures with significant long term benefits might be discarded or overlooked limiting the potential for further reductions after 2000.
- Some feared that if we stuck to the 2000 target we may inflict unnecessary pain if reductions are achievable only slightly later.

Measurability

The need for measurable initiatives was emphasized by everyone.

- It is important to be able to measure progress in order to have credible action. Whether it is to assess a phased approach or to identify other shortcomings to fine tune measures, the ability to assess the progress is a critical component of any package of measures. This should be considered in choosing measures.
- The lack of detail on specific measures raised the question of measurability for all stakeholders. There was concern as to effectiveness and costs to individual sectors or regions.

Integration

There was considerable discussion relating to the integration of actions on climate change to other initiatives. It must be recognized that the NAP cannot exist in isolation.

- There needs to be an explicit tie to other activities. There was some concern that we might merely be offsetting wrong market signals from government.

Ensure consistent messages. One example was that we might lose the benefit of modal shift measures in Atlantic Canada if rail lines are abandoned now.

- There was some concern expressed that the plan and these measures were not tied explicitly to other environmental problems.
- There was also some concern expressed that there was no explicit tie or criteria relating to other government priorities and constraints. An example would be deficit reduction.

Role of Canada Globally

There was some concern that the global context was not addressed in the plan.

- Some participants reiterated the point that overall Canada was a minor player in terms of greenhouse gas emissions worldwide, representing 2% of total emissions. Some felt that failure to meet the 2000 deadline would not be critical in the bigger scheme of things. Others felt that Canada needed to show leadership regardless of our contribution.
- Some participants felt that by excluding measures for such things as exporting technologies or tradeable international permits, the NAP was missing significant opportunities for global reductions. The social and ethical issues raised by global programs were complicating factors here.
- It was also felt that there had been enough trouble working towards consensus in Canada without even more people at the table. A Canadian program might be a first manageable bite in the process.

October 17, 1994

ANNEX 1(B)

EXCERPTS FROM WRITTEN SUBMISSIONS
ON THE
DRAFT REPORT ON OPTIONS FOR
CANADA'S NATIONAL ACTION PROGRAM
ON CLIMATE CHANGE

***List of Contributors:**

Alberta Wilderness Association
Alliance for Responsible Environmental Alternatives (AREA Canada)
Association of International Automobile Manufacturers of Canada
AMOCO Canada Petroleum Company Ltd.
Association de l'Industrie de l'Aluminium
Atlantic Wind Test Site
Banff Recycling Society
Canadian Association of Energy Service Companies
Canadian Cement Council
Canadian Gas Association
Canadian Home Builders' Association
Canadian Industry Program for Energy Conservation
Canadian Institute of Forestry
Canadian Nuclear Association
Canadian Pulp and Paper Association
Canadian Steel Environmental Association
Canadian Urban Transit Association
Centra Gas Alberta Inc.
City of Ottawa, Dept. of Engineering and Works
Clear Air Strategic Alliance
Coal Association of Canada
Consumers Association of Canada (Québec)
Council of Forest Industries
Dofasco Inc.
Domtar Inc.
Enermodal Engineering
Environment Committee of the Unitarian Church of Vancouver
Federation of Automobile Dealer Associations of Canada
Geddes Enterprises
GIRAPH Protective Technologies Ltd.

Gomberg, T., Councillor - City of Edmonton
Greenpeace
Health & Welfare Canada
Imperial Oil Ltd.
Lee, W.R. (private interest)
Matrix Inc.
Metro Transit, N.S.
Ontario Ministry of Environment and Energy
Motor Vehicle Manufacturers' Association
Nova Scotia Department of Natural Resources
Nova Scotia Utility and Review Board
Ontario Energy Committee CAC
Ontario/Toronto Automobile Dealers Association
Ontario Hydro
Saskatchewan Environmental Society
Thyer, N.H. (private interest)
Transport 2000 Ontario
Tweeddale, R.E. (private interest)

* **NOTE:** Copies of these submissions are available on request by contacting the NAICC Secretariat at (613) 994-9939.

Section	Comments
	<p align="center">GENERAL COMMENTS</p>
	<p>Stabilization at 1990 levels can not be achieved without serious implications for the Canadian economy; wealth generation is an essential part of any policy of sustainable development. This issue affects all countries and can only be addressed by effective international collaboration. Aggressive, unilateral policies are likely to push investment off-shore, damage the Canadian economy and displace (instead of eliminating) sources of greenhouse gas emissions.</p> <p>We must take a: <i>comprehensive approach</i> addressing all current and projected sources of greenhouse gas emissions; use <i>voluntary measures</i> because the measures required are too broad to be effectively regulated and voluntary measures would avoid the cost of regulatory design and enforcement; programs should limit <i>emissions per unit of production</i>, not be based on total emissions irrespective of actual production achieved; programs should use <i>partnerships and cooperative approaches</i> to reflect the efforts that industry has already made in improving energy efficiency (most short-term opportunities have already been taken, and the remaining opportunities may take a long time to develop).</p> <p align="center"><i>(Alliance for Responsible Environmental Alternatives -AREA Canada)</i></p>
	<p>We believe the governments must focus on a hierarchy of approaches to achieve the desired reductions most economically: <i>Voluntary Approaches; Broad-based Economic Instruments; Command and Control Measures</i> (only used where there is dire social need and where voluntary and economic approaches have not worked).</p> <p>The motor vehicle segment is singled out for a high level of additional regulation and new economic disincentives. An uninformed observer might conclude that this segment is being singled out for previous lack of cooperation for environmental improvements. Auto Manufacturers have responded to voluntary programs in the past and have made significant improvements in vehicle fuel economy. However, these advances have been offset by a change in individual behaviour.</p> <p>The AIAMC (Association of International Automobile Manufacturers of Canada) supports continuation of voluntary targets for improvements in the fuel efficiency. The AIAMC suggests that an increase in the price of gasoline may be required. While gasoline price increases cause a shift in the choice of vehicle and its usage, gasoline price increases only affect a limited range of greenhouse gas emitting activities. For this reason the AIAMC encourages governments in Canada to consider a carbon fee as the most broad-based, fairest and potentially least damaging mechanism. The charge should be phased in, and revised as the science continues to evolve, and should be harmonized internationally to minimize impacts on Canada's competitiveness.</p> <p align="center"><i>(Association of International Automobile Manufacturers of Canada)</i></p>

Section	Comments
	<p>Amoco supports voluntary initiatives. We are impressed with the approach recommended by government as being a pragmatic, reasonable solution of letting us get on with the business' of emission reduction. Review and reporting components, if required, must clearly be simple and cost effective. We do however encourage Canada as a member of the international community to increase its efforts to resolve scientific uncertainties to enable us to proactively adjust our program as more information becomes available. Amoco endorses a method of measurement on a per unit of production basis. As our company grows, our emissions will increase. However, we recognize our responsibility to measure ourselves on the 'efficiency' of associated emissions.</p> <p><i>(AMOCO Canada Petroleum Company Ltd.)</i></p>
	<p>The program seriously underestimates the potential contribution that renewable energy resources can make to meeting Canada's long term commitment to limit greenhouse gas emissions. Wind energy is cost effective, has the potential to supply significant amounts of energy, can be a valuable economic development tool, and is not vulnerable to escalating fuel prices. Finally, Canada has significant advantages over other countries using wind energy.</p> <p><i>(Atlantic Wind Test Site)</i></p>

It is important at the beginning of this policy process to show interested parties that many options exist. At some stage, however, the range of policy options must be narrowed. In this regard, the "Report on Options..." offers too many options. Without ranking options by priorities, the report seems premature. More than a 'shopping list' is required.

To rank the options, criteria for assigning priorities are needed (e.g. technological feasibility, economic efficiency). However, policy planning must also consider administrative efficiency (getting the most out of the limited resources of various agents: the market, industry, regulatory organs of government, and individual tendencies to be free-riders). Considering the behaviour of organizations and individuals, aiming at a minimal solution will no doubt render a response that is less than that desired.

The CCTG should recommend a stronger package of options than that described as Modelling Scenario #3, for if we aim to merely cap emissions through voluntary measures alone at the 1990 levels by the year 2000, we will likely be faced with policy failures.

By mentioning scientifically misleading options, the Report accords them legitimacy which should be dismissed. Examples include:

- Crop-derived biomass fuel: studies over the past 12 years regarding full-cycle energetics and social and economic costs of biomass fuels indicate that they should not be considered environmentally sensible substitutes for fossil fuels. (Refer to work done by David Pimentel, 1983-84 in 'Bioscience' and studies by the US National Academy of Sciences.);
- Carbon sinks: it is tempting, but misleading, to plan on forests as net carbon sinks or offsets for fossil fuel consumption. The report emphasizes this more than scientific analysis warrants.

Several options could be promoted, or introduced sooner. These include:

- Education: focus on an active dissemination of the knowledge that actually exists;
- Certify Energy Efficiency Specialists: train and certify energy efficiency specialists and require that they be on staff and active in conservation programs within companies that seek government subsidies, depreciation allowances, tax credits, etc.;
- Diffusion of Knowledge about Building and Housing Technology:
 - the 1995 Energy Code for Buildings, and the 1995 Energy Code for House of the National Research Council (NRC) should be promoted as step one in a challenge program to all municipalities;
 - more efficient building standards (R-2000 & C-2000 standards) should be promoted for new and renovated housing;
 - certify auditors and require energy audits of all real estate transactions.

... (Cont'd next page)

(Banff Recycling Society)

Section	Comments
	<ul style="list-style-type: none"> □ Establish an Atmospheric Insurance Commission: establish a carbon tax, as with the UIC accounts, as a separate account from the federal government's general revenues. Compensation could initially be directed towards institution building and education in order to prepare society to adapt quickly if it becomes more evident that a rapid reduction in greenhouse gas emissions is warranted. <p>In order to help increase 'buy-in' of the Measures Package:</p> <ul style="list-style-type: none"> □ In the short-term to mid-term: cooperate and collaborate with energy efficiency experts in other countries who have shown that energy efficiency can help to promote market efficiencies and economic competitiveness (e.g. former head of Japanese Science Council, Dr. Jiro Kondo); □ In the mid-term to long-term: promote international leadership within the fossil fuel industry by encouraging collaboration through high-level seminars; □ Slow GHG emissions worldwide to obtain a longer window to adapt to foreseen changes. <p><i>(Banff Recycling Society)</i></p>
	<p>We are disappointed that the list of measures tends to be technological changes rather than decision-making changes. There are three barriers to energy conservation: corporate will, political will and individual will. We urge the CCTG to focus its efforts more towards changing the institutional and corporate decision making processes rather than endless lists of technologies.</p> <p>This document is a laundry list of possible solutions to a set of problems that is not defined, nor seemingly understood. The application of any one of these measures, and its success in achieving savings, are highly dependent upon the situation in which it is applied.</p> <p>There are no 'one size fits all' solutions. Energy efficiency is by nature a diffused and decentralized solution. This report sets up different modelling scenarios based on the degree of voluntarism versus command and control.</p> <p>Using voluntarism versus regulation as the continuum from which the five modelling scenarios have been chosen prevents the choice of the best tool for the specific task. In some cases, regulations create barriers to energy efficiency. Perhaps the popular 'revenue neutral' approach to fiscal instruments can also be applied to regulations: 'don't make new regulations to deal with the inefficiencies created by existing ones'.</p> <p><i>(Canadian Association of Energy Service Companies)</i></p>

Recommend that the most appropriate measure of industry performance would be the amount of emissions per unit of production. This is a more accurate indicator than absolute emission levels which are tied to overall production.

We must take a path which is environmentally and economically sound, allowing Canadian industries to remain competitive.

Comments on Approach & Principles:

- strongly support the voluntary approach
- agree with the guiding principles; these should be treated as more than just platitudes
- agree in general with the "overall strategic direction and approach"
- dwelling on measures to reach 10%, 20% or 30% reductions in emissions in the post-2000 period would be unwise
- reinforce our involvement with and commitment to the work of the Canadian Industry Program for Energy Efficiency (CIPEC) in developing industry *energy efficiency* programs - these make tremendous economic and business sense and should not be compromised by focusing on total CO₂ output

(Canadian Cement Council)

In accordance with the U.S. program, include all greenhouse gases and direct more attention to the reduction of methane emissions.

(Canadian Cement Council)

Section	Comments
	<p>The housing industry supports sustainable development. It supports housing which is environmentally friendly and economically viable. The measures have been developed without an understanding of the state of Canada's housing industry. Some of the measures do not reflect key federal policy directions, the extensive work which the housing industry has done toward achieving the goals of NAPCC or of the most effective way to reach those goals in the housing sector. Furthermore, the measures for the residential sector were developed without consulting CMHC, Canada's national housing agency, or CHBA, the national association of the housing industry.</p> <p>The measures do not reflect the extent of reductions to be achieved to meet Canada's target or the sectors from which most greenhouse gas reductions should come. The CHBA would support an emphasis on voluntary action programs. However, such programs must be developed in partnership with CHBA and CMHC. The CHBA recommends that the Pilot Joint Implementation Initiative be used as a vehicle to export Canadian housing products, technologies and services. The CHBA recommends an approach to increasing energy conservation in new housing which is based on the principles demonstrated in the R2000 program. CHBA supports the intent of the proposed training programs. However, Because the CHBA has done extensive work in this area, such plans should be discussed with them. The CHBA supports the promotion of increased densities in urban areas and wishes to be a partner in this work. The CHBA strongly urges that measures for the residential sector include research and development and technology transfer.</p> <p>The Residential sector has already achieved far more energy savings (and therefore made more contributions to greenhouse gas emission reductions) than the commercial, industrial or transportation sectors. For reasons of equity and effectiveness, these factors must be taken into account when deciding on measures to reduce greenhouse gas emissions by sector.</p> <p><i>(Canadian Home Builders' Association)</i></p>
	<p>The CO₂ reductions envisaged by some beyond 2000 need to be well articulated so that the public are clearly aware of the implications. Greater elaboration is required of the sentence " ... a strictly sectoral approach to mitigation is insufficient. A cross sectoral approach is required."</p> <p><i>(Canadian Industry Program of Energy Conservation)</i></p>
	<p>Section on forestry measures is quite brief. Additional measures could be considered such as, a research program on the effects of climate change on various tree species; the use of waste wood from forestry operations to produce energy; and, the use of alternative energy sources for forest products mills and equipment.</p> <p><i>(Canadian Institute of Forestry)</i></p>

Section	Comments
	<p>If Ontario's nuclear fleet is replaced over the long term by fossil-fired generation, total provincial CO₂ emissions can be expected to double before any economic growth is added.</p> <p>Should Bruce A nuclear station close (because Ontario Hydro has deferred plans to retube all units at this station indefinitely) AND its capacity be replaced, directly or indirectly by fossil fuels, the result would be increased Ontario CO₂ emissions of about 12% of the 1990 total.</p> <p>One of the options considered by the CCTG is increased use of cogeneration. Virtually all of this will be gas-fired. If this generation displaces or prevents the increase of nuclear generation, then it can be said accurately that this cogeneration is in fact adding to global warming, even if it is doing so efficiently.</p> <p><i>(Canadian Nuclear Association)</i></p>
	<p>We support the use of voluntary measures to meet Canada's stabilization goal. There is particular concern in the industry that if Canada moves towards this goal with the use of regulatory and fiscal tools rather than in a voluntary way, competitiveness will suffer. The Canadian pulp and paper industry is particularly vulnerable with regard to loss of competitiveness, since most production is exported.</p> <p>There is some concern that there is insufficient emphasis on the use of biomass as a fuel. The pulp and paper industry has made significant progress in doing so. Further, there is insufficient emphasis on the value of forests as carbon sinks. Improvements to forest protection to reduce losses to fire and insects as well as measures to improve the health and growth of Canadian forests will help increase the carbon sink.</p> <p><i>(Canadian Pulp and Paper Association)</i></p>
	<p>We feel the most important principles to design the climate change program are: Shared Responsibility and Effectiveness; Least Cost Solutions and Competitiveness; Transparency and Accountability. We feel interested parties should be given another chance to provide input when the full economic implications of the measures are available. We strongly support a voluntary approach and suggest that carbon sequestering sinks be further explored.</p> <p><i>(Canadian Steel Environmental Association)</i></p>
	<p>Most of these measures have been identified before, but have not been followed with significant actions.</p> <p><i>(Canadian Urban Transit Association)</i></p>

Section	Comments
	<p>It is possible that the voluntary measures will reach the stabilization goal, at least on the per unit basis. The regulatory and tax measures should be adopted only if the voluntary measures do prove to be inadequate. Further, the imposition of mandatory and tax measures should only be undertaken after dialogue with affected stakeholder. We should work with programs we <i>know</i> will work: voluntarily monitor and mitigate methane emissions; encourage residential and industrial customers to convert to natural gas through grant programs; convert government fleets to NGV; allow cost recovery of R & D expenditures of natural gas utilities through a rate surcharge; increase government research on the greenhouse effect science; have governments work on the international scene for a common approach to stabilization.</p> <p><i>(Centra Gas Alberta Inc.)</i></p>
	<p>The National Action Program on Climate Change should include the development of common elements necessary for the implementation of these local initiatives. Two examples are:</p> <ul style="list-style-type: none"> - a monitoring system for CO₂ and other pollutant emissions at the municipal/regional level; and - information determining the CO₂ reduction potential of different measures. <p>Reducing CO₂ emissions cannot be achieved without the full participation of all sectors in the city, especially that of its major employers.</p> <p><i>(City of Ottawa)</i></p>
	<p>Some of the CASA (Clean Air Strategic Alliance) stakeholders wish to emphasize that the short term element of the national action plan must move substantially beyond the voluntary component. However, others believe that voluntary measures must be adopted first and then monitored, or should be the only measures considered at this time.</p> <p><i>(Clean Air Strategic Alliance)</i></p>

Section	Comments
	<p>The Draft Report will be significantly improved by de-emphasizing regulations and taxation, and focusing on energy efficiency. There is insufficient economic or sector context to understanding the potential effect a measure will bear on a particular sector. The recommended options for ministers are obviously missing and still under development. We would like these for our consideration. The plan presents an overwhelming focus on measures aimed at the improvement of energy efficiency and resource utilization. In our view this focus is well placed.</p> <p>There is a problem in pursuing energy efficiency with a program that uses greenhouse gas emissions as a surrogate for assessing the measures. Improvements in output performance using standards of productivity and costs, or macro-economic standards (energy per unit of GDP), are the best measures of energy efficiency. Improvements in energy efficiency yield collateral emissions reductions across an economy regardless of where or within which industry. Attempting to get energy efficiency improvements by forcing reductions in greenhouse gas emissions on the other hand biases efforts towards fossil fuels rather than across an economy. In Canada such biases create regional as well as industrial splits and breaks down support for the program.</p> <p><i>(Coal Association of Canada)</i></p>
	<p>How can a position on policy be taken without knowing where it will be applied? Measures which may be interesting for some regions, could prove to be disastrous for other regions.</p> <p>In regards to the issue of political consideration being extended, does this imply that some members of Canadian society will be permitted to shirk the responsibility of addressing the problem of climate change? It must be a broad-based priority.</p> <p>In order to spur action on reduction of greenhouse gas emissions in industrial production, voluntary measures should be buttressed by regulatory and mandatory measures.</p> <p>We are in support any group of measures that will not create serious adverse effects for consumers, by forcing them to bear the brunt of actions aimed at reduction. That is to say, measures that would not affect the 'global family budget'.</p> <p><i>(Consumers Association of Canada (Québec))</i></p>
	<p>The Task Force has neglected to include the use of wood residue as a fuel substitute for current uses of natural gas and other fossil fuels.</p> <p>The inclusion of wood residue and biomass as a measure for reducing greenhouse gas emissions is critical in a national action plan to address climate change and we suggest that the draft outline be amended to include this obvious omission.</p> <p><i>(Council of Forest Industries)</i></p>

Section	Comments
	<p>We are committed to improving our consumption of energy per unit production. We are committed to the implementation of cost effective energy efficiency improvement activities as our strategy to aid Canada in achieving its international commitments on greenhouse gas reductions.</p> <p>We agree, generally, with the approach of packaging several measures into various "scenarios" and attempting to assess the benefit and cost of the scenarios. We are disappointed that comprehensive cost/benefit impacts are not yet available.</p> <p>We would not support the adoption of any further mitigative measures that would move us beyond stabilization.</p> <p>We suggest that the use of carbon sequestering sinks be further explored, examined and adopted as part of the reduction strategy in net greenhouse gas emissions.</p> <p>We find that those measures aimed at the transportation sector to be heavily weighted toward economic (tax and fiscal) and regulatory measures.</p> <p><i>(Dofasco)</i></p>
	<p>Initiatives must focus on achieving reductions in the net contribution to greenhouse gas (GHG) emissions. For energy related activities, this required reduction is in fossil fuel consumption. The specific initiatives outlined as options are focused on the overall subject of energy efficiency.</p> <p>An important issue is whether or not to include regulatory measures and economic instruments to supplement voluntary initiatives (which are included in the scenarios #2 and #3). Any measures incurring a significant net cost to Canadian must be co-ordinated with out international competitors in order to ensure a positive global impact. This perspective will be not be effective at this stage to proceed with implementation of options beyond the voluntary level.</p> <p>At the March meeting in Berlin, Canada should present revised timelines and goals for our program while urging the development of international accords on the need and timing of more extensive initiatives.</p> <p><i>(Domtar)</i></p>

At the Outreach Workshop there was a high degree of consensus that effectiveness must be the primary criterion for establishing an action plan (i.e. reducing greenhouse gas emissions). The specific initiatives outlined as options are focused on the overall subject of energy efficiency. To the extent that energy is derived from non-fossil fuels (i.e. hydroelectricity) the focus of these initiatives will be diffused. To be effective all energy related initiatives should be tied to reasonable expectations of achieving reduction in fossil fuel use. The time line for stabilization is unreasonable. We will not achieve either international respect of the buy-in of Canadian stakeholders by driving the initiative based on unrealistic goals.

(Domtar Inc. - Second Submission)

A number of compromises have been made in order to produce a consensus document.

Uncertainty as to how much reduction in GHGs is targeted from each of the measures. Targets with dates would give stakeholders a goal to work towards and the opportunity to discuss stricter measures if consensus cannot be reached through consultation.

There needs to be a definition of "financially attractive" and it should include the environmental costs which are not factored into most analysis presently.

Comments re: Residential Energy Consumption Measures for New Housing:

1. Re: **opportunities** - the words "renewable energy" should be added to the first sentence as a compliment to energy efficiency and load management initiatives.
2. Re: **barriers** - an extra bullet should be added that refers to the complexity of consumer attitudes and the need to market the program so that the non-economic benefits of the measures are promoted.
3. Re: **split incentives** - If the entire cost of a renovation that improves energy efficiency, increases use of renewable energy, or improves load management of a building could be deducted from income, there would be an added financial incentive for the landlord to include those features in any renovation.

(Enermodal Engineering)

Section	Comments
	<p>Suggestion that rank ordering for the 12 Principles for a National Action Program, pages 8 - 10 of the Report on Options... be revised.</p> <p>Proposed Order of Rank/ Rationale for Change:</p> <ol style="list-style-type: none"> 1. Effectiveness - Major cuts in emissions are needed immediately. It must be recognized that the stakes are enormous 2. Timing - As soon as possible. 3. Integrated Approach - Develop public support for reductions by identifying and advertising social, economic & health benefits. 4. Comprehensiveness - Consideration must be given to <u>all</u> emission sources and sinks 5. Adaptability/Flexibility - Strive for scientific certainty, but remain <u>honest</u>. 6. Maximize Partnerships with Other Countries - A process similar to that adopted by the Montreal Protocol on ozone depletion would provide an excellent model for coordinated international action. 7. Shared Responsibility - Get citizens involved; encourage volunteer actions; spread political fallout and credit to all parties in all levels of government. 8. Transparency/Accountability - Graphic depictions which highlight what ignoring the problem may result in would likely elicit helpful emotions, which in terms of public awareness, are as important as cognitive (statistical) approaches. 9. Competitiveness and Job Creation - Stress the need for sacrifice. 10. Fiscal Responsibility - Factor costs of GHG, as well as traditional air pollutants into cost/benefit analyses. 11. Least Cost Solutions - 'Least cost' measures should be taken first. Taxing GHG will raise revenue for re-tooling infrastructure & provide incentives to reduce sooner rather than later. 12. Proportionality - Allowances or subsidies for polluters, if any, should be part of a strategy which results in maximum deceleration of GHG, world-wide. <p>(Environment Committee of the Unitarian Church of Vancouver)</p>

Section	Comments
	<p>In general, support is extended to environmental measures that:</p> <ul style="list-style-type: none"> □ are developed as a result of serious consultation with the industries involved; □ focus on the need for voluntary action instead of regulations and legislation that distort market forces and have negative impacts on jobs and investment; □ consider the direct and indirect value of the Canadian transportation sector and infrastructure to every Canadian resident; and, □ are broad-based and affect all industries and consumer equitably. <p>Objection to measures that discriminate or arbitrarily punish individuals because they require an automobile for work or commuting.</p> <p>Opposition to measures that mandate reduced parking or make it cost prohibitive. Such measures fail to account for the improvements of vehicle efficiencies and the realities of Canadian distances and urban design.</p> <p><i>(Federation of Automobile Dealer Associations of Canada)</i></p>
	<p>Document is quite shallow, perhaps intentionally, and could have contained considerably more depth and a greater indication of technical and logistical understanding of some potential approaches. A little more creativity would also have been refreshing.</p> <p>Comments on Residential Sector Energy Consumption Measures:</p> <ol style="list-style-type: none"> 1. Renovation contractors are not, as a group, interested in energy conservation, unfortunately, neither are their customers. 2. Report totally ignores potential energy savings by addressing the whole mechanical system(s) as an entity. This report seems to totally miss the mechanical system opportunities. 3. The key motivator is the availability of a financial package that results in monthly energy cost/loan payments that are lower than, or equal to, other alternative energy costs and financing options - low cost convenient financing is critical. 4. Making one's home more energy efficient is not considered a renovation. Many renovation activities can increase energy loads. <p><i>(Geddes Enterprises)</i></p>

Section	Comments
	<p>The guiding principles should include a statement to the effect that National Actions <u>will</u> be taken to achieve the target.</p> <p>re: Transportation - This important topic must have its own breakout in Modelling Scenario #1. The most important requirement is to develop that new technology with the objective of having not less than 2% of all vehicles sold in (say 1999) using the new fuel efficient, minimal pollution vehicles.</p> <p>I do <u>not</u> support many of the proposed actions (re: automobiles) listed in Scenarios #2 and #3, but <u>do</u> support more emphasis on rail for long distance freight. I would not support expenditures on high speed trains.</p> <p>New techniques have been developed in the last ten years for utilizing solar heat energy for domestic, commercial and industrial purposes. These techniques must be developed, publicised, and utilised to reduce the consumption of fossil fuels.</p> <p>(GIRAPH Protective Technologies Ltd.)</p>
	<p>Based on discussions at the Calgary workshop, I believe that the idea of using Model 3 as the basis for discussion is the wrong approach, in that it will not even begin to reach the targets as identified by the federal and provincial ministers. The starting point should be actions to meet and exceed the target. Anything less will not meet our international obligation, nor the ecological imperatives we face.</p> <p>The challenge is to find initiatives that meet the most urgent concerns, jobs and environmental protection. The time is right to invest in 'Green Jobs' to help people reduce their energy and resource consumption, and to save money.</p> <p>(Tooker Gomberg, Councillor, City of Edmonton)</p>
	<p>Greenpeace Canada responded to the 'Report on Options...' by providing the CCTG with it's brochure entitled, "Greenpeace: Climate/Green Jobs Action Plan".</p> <p>(Greenpeace Canada)</p>
	<p>The Report does not sufficiently explore the potential impacts of climate change on public health. Long-term public health ramifications need to be more clearly presented. A stronger link between health and climate change may help to secure greater public buy-in.</p> <p>(Health Canada)</p>

Section	Comments
	<p>Public health issues are not mentioned to any extent. The impacts on public health may also be linked to ecosystem changes and down stream effects resulting from changes in food availability, water quality/availability, and disease occurrence/prevalence.</p> <p>Also, there should be discussion of health impact analysis of the control and mitigation strategies being explored to deal with climate change.</p> <p><i>(Health and Welfare Canada)</i></p>
	<p>Achieving stabilization in Canada is likely to require serious and costly interventions into our economy. We believe that Canada's stabilization target should be re-calibrated to maintain our international competitiveness. Further, the cornerstone of the Canadian program should be the Voluntary Challenge Program. Comprehensive treatment of all gases, sources, and sinks in an important adjunct to the voluntary program.</p> <p><i>(Imperial Oil Ltd.)</i></p>

Section	Comments
	<p>In the low energy price environment that is envisioned in the Measures, I do not think that the voluntary and regulatory actions that are proposed will produce the required reductions in emissions to achieve either the 2000 or 2005 targets.</p> <p>The environment of long phase-in periods for many of the Measures will clearly not help Canada achieve it's 'stabilization' commitment by the year 2000.</p> <p>Two measures that are clearly absent that have large effects in the short-term are the large increases in energy or emission charges (e.g. carbon input or output taxes) and another quick round of CAFE (corporate average fuel economy) standards. I understand that it is hard to move in many of these areas without accompanying U.S. actions, and as such, this makes it very important to vigorously pursue items such as F.6 and Measure 5.8.</p> <p>Following U.S. initiatives as outlined in their Action Plan (Technical Supplement, March 1994) will certainly not carry the day. The U.S. seem to be particularly deficient in their transportation initiatives which concentrate on reducing vehicle miles travelled and labelling of tires. This is weak, especially if they are looking to achieve short term results.</p> <p>The two biggest sources of emissions are the transportation (including agricultural, commercial components, and industrial off road use) and industrial sectors. Measures that would affect these sectors <u>quickly</u> must surely be necessary if the 2000 target is to be met. In regards to the industrial sector, Measures designed to target the 'big six' (pulp and paper, chemicals, smelting and refining, steel, mining, petroleum refining) must be implemented.</p> <p>The 'capture and disposal mitigation' option receives little focus in the Measures. I believe that it should be pursued more vigorously.</p> <p>In the original NRCan outlook (CEO) producer own-use/losses of energy by the energy industries show the largest contribution to emission increases over the 1990-2000 period. NRCan does not detail the reasoning behind this sharp increase. Does the rationale lie with the steady move towards heavier oils and deeper gas requiring more energy for both recovery and processing?</p> <p>Similarly, the rationale for the increase of emissions' contributions from the non-combustion energy use category is not explained.</p> <p>(Cont'd on next page...)</p> <p>(William R. Lee, Consulting Energy Economist)</p>

Section	Comments
	<p>There seem to be no arced limits associated with the proposed measures, and even though are already above the 1990 limit, there is no suggestion of restricting incremental sources of CO₂ equivalent emissions. With this in mind, what are carbon offsets that can be earned in some of the Measures (e.g. F.4, 7.6) to be offset against?</p> <p>The Report states that most of the CO₂ equivalent emissions for the upstream energy production and supply industry is from methane. My calculation based on the CEO and Jaques (dec. 92) is that some 80% of these emissions are CO₂ (based on a GWP of 22 for methane).</p> <p>The 'base-line' emissions outlook assumes well above average growth in goods producing activities to 2010. Is this a reversal of the trend over the past 30 years towards more service type industries? Is this a common theme of base lines in other industrialized countries? There should be some commonality of assumptions in this regard.</p> <p>Wood fuel is included in the residential sector energy balance. Should this be excluded on the same rationale as in the industrial sector where sustainability is assumed, i.e. that as much wood is grown to sequester CO₂ as is burned which produces it?</p> <p>I do not see much discussion in the Measures aimed specifically at moving from more to less carbonaceous fuels across the fossil fuel spectrum, i.e. from coal towards natural gas.</p> <p>The development of the mechanism for JI (Joint Implementation) regimes should help encourage the adoption of permit trading systems within individual countries.</p> <p>Is study of JI to be confined to joint projects with developing countries? If so, why? Many opportunities for cost effective interchanges will also exist among industrialized countries.</p> <p><i>(William R. Lee, Consulting Energy Economist)</i></p>
	<p>Contents, as they relate to solar energy, indicate that there are some areas which need further elaboration.</p> <p><i>(MATRIX Inc.)</i></p>
	<p>The Transportation Sector Measures are too mild and too long term in their approach to reducing green house gas emissions.</p> <p><i>(Metro Transit, Nova Scotia)</i></p>

Section	Comments
	<p>Extensive public education is required before global warming is seen as a serious problem, such as health care or employment. Until the gravity of the problem is widely shared, governments can do little to address the problem.</p> <p>To meet the 2000 target, economic growth has to be decoupled from growth in energy use. For example, no new houses can be built, no matter how efficient they may be, without retrofitting existing houses to bring them up to par in energy consumption.</p> <p>In order to meet the 2000 target through voluntary measures alone (industry view), Ministers should ask industries to provide detailed costs, timetables, etc., within the next 6 months, outlining how they propose to meet the 2000 target voluntarily.</p> <p>There appears to be a unanimous view that governments cannot, at this time, commit major new expenditures to address this problem. From the consumers point of view, the corollary is 'no new taxes'.</p> <p><i>(Ontario Energy Committee CAC)</i></p>
	<p>We support the initiative to give individual electric utilities the responsibility for:</p> <ul style="list-style-type: none"> - the evaluation of the applicability of the Measures to their situation; and - the establishment of targets and schedules <p>We support the use of full cost accounting and life cycle assessment for comparison of greenhouse gas reduction measures.</p> <p>Overall, the Measures are poorly written and incomplete. The Overview Section is incomprehensible.</p> <p><i>(Ontario Hydro)</i></p>
	<p>I consider the following two measures to be absolutely fundamental to any serious attempt to reduce greenhouse gas emissions:</p> <ul style="list-style-type: none"> □ Growth, in all forms, must be stopped. Particular attention should be paid to the abatement of population growth in Canada and the growth in the use of its resources. If this is achieved, the increase in our production of all wastes and pollution, including human-caused CO₂ and other greenhouse gases will decrease; □ Far more emphasis should be placed on the role of Canada's forests as carbon sinks and as a source of renewable jobs through their maintenance. <p><i>(Vivian Pharis, Director, Alberta Wilderness Association)</i></p>

Section	Comments
	<p>It is important that the development of the packages of options, be guided by a careful review of the cost, emissions and economic impact data.</p> <p>The National Action Program should consider measures which are capable not only of reducing emissions in the near term, but also those which would position Canada to realize sustained longer-term reductions, such as those relating to renewable energy.</p> <p><i>(Ontario Ministry of Environment and Energy)</i></p>
	<p>Reduction and re-use should take priority over recycling, which uses energy too.</p> <p>On a global scale, the fundamental causes of environmental problems are: too many people, consuming too much, and evading responsibility for the consequences of their actions. Voluntary measures to solve these problems may not be enough.</p> <p><i>(N.H. Thyer - private interest)</i></p>
	<p>I am surprised and disappointed that in a draft outline NAP on Climate Change more attention or even priority should not have been given to encouraging an action in which Canada has excelled (e.g. Point Lepreau, NB) in meeting future energy and environmental needs, particularly with respect to the urgent and important issue of Climate Change.</p> <p><i>(R.E. Tweeddale, P. Eng. - private interest)</i></p>
	<p>If policy makers deem that reductions must be made in greenhouse gas emissions, it should be done without hampering the successful workings of provincial regulatory commissions. The introduction of dysfunctional parameters into the regulatory processes will make it impossible to effectively undertake least-cost planning exercises and will significantly increase customer's rates.</p> <p><i>(Nova Scotia Utility and Review Board)</i></p>
	<p>Information on the cost of individual measures was not provided, nor did the package recognize the importance of cost and jurisdiction (who would likely have to implement measures) as issues. Out of 7 measures proposed Modelling Scenario 1, the Nova Scotia Government and/or municipalities would have to find additional financial and staff resources in order to implement at least 15 of them.</p> <p><i>(Nova Scotia Department of Natural Resources)</i></p>

Section	Comments
	<p>Our Association believes in developing Canada-wide strategies. These strategies should first and foremost be of a <i>voluntary nature supported by a public awareness campaign</i>. Whereas control measures which can distort economic growth and reduce investment and sales should only be undertaken when there is overwhelming evidence the voluntary and economic instruments have been attempted and failed to achieve its necessary reductions.</p> <p>(Ontario/Toronto Automobile Dealers Association)</p>
	<p>We support Modelling Scenario 5 because it is a more suitable starting point for planning to meet Canada's commitments.</p> <p>(Saskatchewan Environmental Society)</p>
	<p>The proposed merger or buy-out involving CPR and CNR will only hasten the demise of Canada's rail network, when what Canada needs is a massive modal shift back to the environmentally, economically and socially sustainable rail mode. This buy-out/merger east of Winnipeg could result in many hundreds - if not thousands of kilometres of rail abandonment, including main lines.</p> <p>The interest due to debt funding for capital spending on roads already existing in Ontario is about a billion dollars a year. Motor vehicles are likely the largest source of air pollution world wide and we are having a drastic increase in respiratory problems.</p> <p>Instead of traffic from abandoned rail line shifting to roads, a shift from roads to rail would alleviate traffic congestion, improve road safety, decrease road damage, pollution, the need for more roads and improve our economic competitive advantage.</p> <p>Having just attended a Canadian Environmental Network conference, I frankly doubt if the importance of greenhouse gas emissions reduction is clearly generally understood, or how a modal shift to rail could facilitate this.</p> <p>(Transport 2000 Ontario Inc.)</p>

Section	Comments
	<p>We would like to register our concern over the imbalance of the CO₂ measures weighted against the motor vehicle. Sectoral economic measures are all of the incentive type, except in the transportation sector where a majority are punitive (increased taxes, etc.) in nature. Since punitive measures require some legislative or regulatory authority, these measures should also be recognized as regulatory as well as economic.</p> <p>The Measures Working Group report frequently refers to subsidies, inappropriate cost allocations, and unrealistic pricing practices in various areas of energy use which are alleged to be impediments to rational decisions reached for GHG reductions. The solutions proposed are all too familiar - more subsidies and unrealistic pricing of public transit and other activities which are already receiving heavy indirect support. Motor vehicle users on the other hand are targeted for a whole new range of taxes and increases in existing levels, on the premise that they are not paying their fair share.</p> <p><i>(Motor Vehicle Manufacturers' Association)</i></p>

Section	Comments
	PART I: FOUNDATION MEASURES
F1	Initial program should be entirely voluntary. CIPEC is a good example. (<i>Canadian Cement Council</i>)
	The Canadian Home Builders Association (CHBA) generally supports the voluntary foundation measures contemplated. (<i>Canadian Home Builders' Association</i>)
	We strongly support this measure. However, explanation is required as to why this measure would not apply to all sectors rather than be restricted to just industry and government.
	Reference to the "National Climate Change Program" is vague and needs clarification.
	The definition of "industry" being used by the Measures Working Group needs to be spelled out and clarified. (<i>Canadian Industry Program of Energy Conservation</i>)
	We strongly support this foundation measure as it can be put in place at essentially no cost to the Canadian taxpayer. (<i>Canadian Steel Environmental Association</i>)
	Delete the word "voluntary". (<i>GIRAPH Protective Technologies Ltd.</i>)
	It should be explicitly recognized that MANY additional measures regarding the reduction of emissions will be proposed by industry and other stakeholders. (<i>Canadian Gas Association</i>)
	We strongly support this measure. Care should be taken to avoid duplication of effort and confusion as to what may be seen as two voluntary programs with the similar objectives. We endorse cost effective energy efficiency improvements as the strategy of choice for our contribution to GHG emission reductions. (<i>Dofasco</i>)

Section	Comments
F2	<p>We would support a National Registry of voluntary measures - to credit, track and evaluate performance. This is a key component of a voluntary program.</p> <p><i>(Canadian Cement Council)</i></p> <p>If this idea is implemented, reporting requirements must be kept to a minimum. They should be primarily geared to enable tracking and evaluation of emission reduction achievements by sector.</p> <p><i>(Canadian Home Builders' Association)</i></p> <p>How will steps be included to reduce emissions since the base year, 1990?</p> <p>It will be necessary to integrate processes for reporting emissions information already established by industry, as well as data collection and other reporting systems (StatsCan, NPRI).</p> <p>No rationale is given for the statement: "No investment in measures that would have already happened will be registered. In particular, cost effective energy savings should be captured through programs that do not allow credits." This statement is inconsistent with what seems to be the objective as stated at the start of F2.</p> <p><i>(Canadian Gas Association)</i></p> <p>We strongly support this foundation measure as it can be put in place at essentially no cost to the Canadian taxpayer.</p> <p><i>(Canadian Steel Environmental Association)</i></p> <p>Delete the word "voluntary".</p> <p><i>(GIRAPH Protective Technologies Ltd.)</i></p> <p>Following wording is suggested: "By itself, the registry for voluntary actions does not give actual GHG reductions.</p> <p><i>(Ontario Hydro)</i></p>

Section	Comments
	<p>We would support this measure. We would expect that all activities that reduce GHG emissions be eligible for inclusion in the registry. In addition, the CO₂ reduction that results when electricity savings are made in our plant should be credited directly to us - not the electric utility.</p> <p>(Dofasco)</p>
F3	<p>We would support a national program of communication and motivation. This is a key component of a voluntary program.</p> <p>(Canadian Cement Council)</p>
	<p>CHBA and CMHC must be involved in developing any planned communication programs targeted toward housing and the housing industry.</p> <p>(Canadian Home Builders' Association)</p>
F4	<p>We support the proposal to establish pilot Joint Implementation Initiative. We would strongly encourage both domestic and international programs.</p> <p>(Canadian Cement Council)</p>
	<p>CHBA recommends that the Pilot Joint Implementation Initiative be used as vehicle to export Canadian housing products, technologies and services.</p> <p>(Canadian Home Builders' Association)</p>
	<p>Question: What mechanisms will exist to offset emissions in Canada from production, processing and transmission of natural gas where the overall cycle emissions are less than if coal was used?</p> <p>(Canadian Gas Association)</p>
	<p>We support this measure as it adds an option that allows extra flexibility in our decision making and achieves results to a global problem.</p> <p>(Canadian Steel Environmental Association)</p>

Section	Comments
	<p>We would support this measure. This measure allows enhanced flexibility in cost effective decisions. Siting of new facilities is one obvious application where we might choose to apply for JI status. Carbon sequestering projects should also be allowed.</p> <p>(Dofasco)</p>
F5	<p>CHBA agrees with the commentary in the Final Report that subsidies are a complex issue and the impacts of reducing, redirecting or removing them must be thoroughly examined before any decisions can be made.</p> <p>(Canadian Home Builders' Association)</p> <p>We support the need for a scoping study to address the subsidies issue.</p> <p>(Canadian Steel Environmental Association)</p> <p>We would support the need for a scoping study to address the subsidies issue.</p> <p>(Dofasco)</p>
F6	<p>Strongly opposed to "design an assessment process for a carbon dioxide emissions charge" .</p> <p>(Canadian Cement Council)</p> <p>The discussions proposed are a waste of time. It is misleading to state that specific portions of industry will have to adjust to such a charge. It may also be misleading to indicate that some OECD countries have introduced various charges, without indicating that they are backing away from such activity.</p> <p>(Canadian Gas Association)</p> <p>We support an emissions trading measure only in the absence of a successful voluntary response. This measure affords some degree of flexibility in allowing individual companies choice of response and is market based.</p> <p>(Canadian Steel Environmental Association)</p>

Section	Comments
	<p>We oppose this measure. A carbon charge (tax?) in any form would substantially increase our costs, our profitability and hence our ability to survive and to continue to invest. If a carbon charge (tax?) were to be introduced, we would have to either pass the extra cost on to our customers or accept reduced returns.</p> <p>(Dofasco)</p>
	<p>Significant changes in the behavioral and consumption patterns of all Canadian, including but not restricted to, changes in transportation patterns, will be necessary. We should focus on strategies to shift from these activities, businesses and sources of power generation which generate more carbon emissions to less carbon intensive activities in a manner which is unbiased towards particular sectors or regions.</p> <p>We encourage governments in Canada to continue to consider a carbon fee as the most broad-based, fairest and potentially least damaging mechanism to cause the shift in Canadian behaviour patterns required to reduce GHG emissions.</p> <p>The carbon charge should be:</p> <ol style="list-style-type: none"> 1) phased in over a long period of time 2) should be harmonized internationally 3) revenues from a carbon change must be used to reduce other taxes to compensate for the negative impact a carbon tax alone would have. <p>(Motor Vehicle Manufacturers' Association)</p>
F7	<p>We support this Foundation Measure with the caveat that before a tradable permit system is ever introduced in Canada, it is harmonized and coordinated with similar programs among our major trading partners so as to avoid a potential damaging impact to Canada's economy.</p> <p>(Canadian Industry Program of Energy Conservation)</p>
	<p>We oppose a measure that calls for a carbon charge in any form. Since we have no alternative to carbon as a reducing agent, a carbon charge would substantially increase our costs, reduce our profitability and hence hamper our ability to survive and to continue to invest.</p> <p>(Canadian Steel Environmental Association)</p>

Section	Comments
	<p>We would support this measure only in the absence of a successful voluntary response. Any trading system would result in some increase in administrative burden in both the company and the government.</p> <p>(Dofasco)</p>
F8	<p>We are opposed to a motivation fund to buy the necessary emission reductions, supporting projects to reduce greenhouse gases. It is much too open-ended and appears to be increased taxation in a different guise.</p> <p>(Canadian Cement Council)</p>
	<p>Industry does not support utility based DSM funding, or industry funding to offset emissions, as sources for a "Motivational Fund".</p> <p>(Canadian Industry Program of Energy Conservation)</p>
	<p>Our support of this measure would be highly dependant on the source of the funding. We would not support any funding sources that add to the economic burden already felt by Canadian manufacturers.</p> <p>(Steel Environmental Association)</p>
	<p>The creating of yet another public fund is irresponsible and would receive the same negative publicity as Ontario's Tire Tax.</p> <p>A tradeable permits system, as discussed in Measure F7, would generate a source of funds to support projects to reduce greenhouse gas emissions at lowest cost, and hence offset the need for a separate public fund.</p> <p>(Ontario Hydro)</p>
	<p>We do not support this measure. Using funds generated from industry for purchases of offsets is just another form of taxation. Funding from demand side management programs by utilities just passes increased costs back to the ratepayers.</p> <p>(Dofasco)</p>

Section	Comments
	PART II: SECTORAL MITIGATION MEASURES
1.1	<p>New data from 1992 StatCan, indicates gas was 46.91 % of residential energy use, not 42% as indicated.</p> <p>It is not clear from the narratives if both electrical and gas utilities are intended for inclusion, nor if this is intended to be a matter for provincial regulatory agency consideration in the case of regulated utilities.</p> <p><i>(Canadian Gas Association)</i></p> <p>We suggest that adoption of the National Building Energy Efficiency Code be mandatory for provinces and territories only.</p> <p>A significant number of energy conservation and alternative energy measures will have to be mandatory.</p> <p><i>(Enermodal Engineering)</i></p> <p>The National Building Code must be revised to require that all new homes be built to the "Advanced Standard" or insulation and ventilation standard.</p> <p>Residential Building Codes must be re-written so that they incorporate the concepts of the Saskatchewan Advanced Homes. This is an urgent action so that all homes built (say) after 1998 will be to this standard.</p> <p><i>(GIRAPH Protective Technologies Ltd.)</i></p> <p>CHBA is dismayed by this measure because municipalities do not have jurisdictional authority to introduce codes. We disagree with the heavy reliance on a regulatory approach. We do not support adopting the National Energy Code for Houses as part of the National Building Code and recommend a R2000 approach to increasing energy conservation (partnership, technology transfer, education, training, marketing, etc.).</p> <p><i>(Canadian Home Builders' Association)</i></p>
1.2	<p>Residential Tax incentives could be added whereby the portions of a mortgage that are related to energy efficiency or the use of renewable energy sources could be tax deductible.</p> <p><i>(Enermodal Engineering)</i></p>

Section	Comments
	<p>CHBA would support this proposal under the following provisions if the proposal involves the CMHC (Canadian Mortgage and Housing Corporation). They have extensive experience with mortgages, and can provide information that would be useful.</p> <p><i>(Canadian Home Builders' Association)</i></p>
1.3	<p>We are not certain that proposals for mandatory measures are consistent with a voluntary program.</p> <p><i>(Canadian Gas Association)</i></p> <p>If a HERS program is to influence a measurable reduction in GHGs, it will have to be mandatory.</p> <p><i>(Enermodal Engineering)</i></p> <p>This proposal is not feasible or acceptable because a mandatory HERS does not appear to have a legal basis and seems to conflict or overlap with both provincial building codes and the R2000 Program.</p> <p><i>(Canadian Home Builders' Association)</i></p> <p>The home energy rating system for new and existing homes would not likely be a priority for provincial expenditure and should be moved to Modelling Scenario 2 or 3.</p> <p><i>(Nova Scotia Department of Natural Resources)</i></p>
1.4	<p>The CHBA supports the intent of the proposal. To make it more useful, the proposal should be discussed with CHBA and coordinated with other education and training activities for the housing industry.</p> <p><i>(Canadian Home Builders' Association)</i></p>
1.5	<p>This proposal should be reviewed in the context of the social housing review and consultation process now underway.</p> <p><i>(Canadian Home Builders' Association)</i></p>

Section	Comments
1.6	<p>Not clear how "utilities" would be involved in "Funding". Does this mean all utilities (gas, electricity, water, etc.)?</p> <p><i>(Canadian Gas Association)</i></p> <p>This proposal is not feasible or acceptable because the application of new mandatory codes to existing housing is contrary to Canadian practice. Furthermore, applying new energy codes to existing houses as a condition of its sale does not have a legal basis because municipalities in Canada do not have the authority to adopt building codes.</p> <p><i>(Canadian Home Builders' Association)</i></p>
1.7	<p>The CHBA is generally supportive of this proposal but suggests that a partnership approach must be used, and that CMHC and CHBA are essential partners.</p> <p><i>(Canadian Home Builders' Association)</i></p>
1.8	<p>A voluntary HERS may be a useful instrument to encourage actions to make existing housing more energy efficient.</p> <p><i>(Canadian Home Builders' Association)</i></p> <p>The home energy rating system for new and existing homes would not likely be a priority for provincial expenditure and should be moved to Modelling Scenario 2 or 3.</p> <p><i>(Nova Scotia Department of Natural Resources)</i></p>
1.9	<p>The CHBA has reservations about this measure. The objectives and parameters of any such program must be developed further in consultation with CMHC and CHBA. Furthermore, if implemented, this measure should be carried out in collaboration with CMHC and the housing industry.</p> <p><i>(Canadian Home Builders' Association)</i></p>

Section	Comments
1.10	A training program is mandatory, as well as qualified instructors. (Geddes Enterprises)
	The CHBA supports the intent of the proposal. To make it most useful, it should be discussed with CHBA and CMHC, and coordinated with other education and training activities of the housing industry. (Canadian Home Builders' Association)
2.1	Environment Canada's Estimates for 1990 point out that landfills are 37.61% of <u>anthropogenic</u> methane emissions in Canada. (Canadian Gas Association)
	Accelerate Application of District Energy Systems - move to Modelling Scenario 1. (Nova Scotia Department of Natural Resources)
2.2	
2.3	
2.4	Somewhat surprising that there is no reference to any role for the CGA, gas utilities, or CIPEC in the "Possible Stakeholder Roles." (Canadian Gas Association)
2.5	
2.6	

Section	Comments
2.7	
2.8	<p>This measure reports that the FBI (Federal Building Initiative) has been successful in promoting the application of EPC among federal buildings managers. What is the success criteria that has been met? CAESCO has worked for three years with NRCan staff. However, if success were measured on how much energy savings had been achieved or by how much greenhouse gas emissions were avoided, I don't believe the term "success" would be applied.</p> <p><i>(Canadian Association of Energy Service Companies)</i></p>
2.9	<p>The "Description of Actions" narrative makes mention of "electrical and gas utility allies", but these are not included in the "Possible Stakeholder Roles" table.</p> <p><i>(Canadian Gas Association)</i></p>
3.1	<p>Accurate, agreed upon baseline data are not yet in place. This is an urgent requirement. Industry must be involved in both the "design/facilitation" of the data base and in "data base development". It is important that energy efficiency data be available on a per unit of production basis.</p> <p><i>(Canadian Industry Program of Energy Conservation)</i></p>
	<p>We support this measure.</p> <p><i>(Steel Environmental Association)</i></p>
	<p>We support this measure. We support the concept of energy efficiency target setting as part of the voluntary response to CO₂ emissions reductions. This target setting, however, should occur at the corporate level only.</p> <p><i>(Dofasco)</i></p>

Section	Comments
3.2	<p>Changes should be made to the phrasing to reflect that benchmarking/best practices are not a new phenomenon among Canadian industry.</p> <p>Under the <u>Description of Actions</u>, the 3rd paragraph should be reworded as follows:</p> <p>"The results of the sector-specific studies will provide base-line energy use information against which individual plants can assess their performance to determine their level of energy ..."</p> <p>And also the next sentence should read:</p> <p>"The opportunity exists for companies to rate themselves according to a scale oriented around the idea of "good", "better" or "best practice."</p> <p><i>(Canadian Industry Program of Energy Conservation)</i></p>
	<p>As a global industry that is energy intensive, we do not believe that government benchmarking exercises could yield data better than that available through our own company and trade networks.</p> <p><i>(Steel Environmental Association)</i></p>
	<p>We question the usefulness of the measure in its practical implementation.</p> <p><i>(Dofasco)</i></p>
	<p>Benchmarking or standards setting for industrial processes must clearly differentiate between direct fossil fuel use and indirect offsets that may be attributable to impact of reduced electrical demands on utility fossil fuel consumption.</p> <p><i>(Domtar)</i></p>
3.3	<p>We strongly support this measure although it questions the need for it to be an expansion of NRCan's existing commercial sector Energy Innovators Program into the industrial sector.</p> <p><i>(Canadian Industry Program of Energy Conservation)</i></p>

Section	Comments
	<p>We would not support an industrial energy innovators program because it is redundant to the CIPEC initiative that is already underway.</p> <p>(Steel Environmental Association)</p>
	<p>We do not support this measure. It is redundant and unnecessary given our commitment to the CIPEC initiative in targeting energy efficiency improvements and the associated corporate activity plans for achievement of those targets.</p> <p>(Dofasco)</p>
3.4	<p>Clarify the role envisaged for "utilities" if all types of utilities have a role, or specify "electrical utilities" consistently.</p> <p>(Canadian Gas Association)</p>
	<p>We strongly support this measure although we believe that it would be beneficial to have it coordinated with CIPEC's proposed National Program of Industrial Consultation to promote energy efficiency.</p> <p>(Canadian Industry Program of Energy Conservation)</p>
	<p>We support this measure.</p> <p>(Steel Environmental Association)</p>
	<p>We would support this measure.</p> <p>(Dofasco)</p>
	<p>All energy related initiatives should be tied to reasonable expectations of achieving reduction in fossil fuel use. For example, in regions where the reduction of electrical energy use cannot be reasonably expected to reduce fossil fuel consumption, it would not be productive (relative to GHG emission reduction) to promote the retrofit of electrical motors.</p> <p>(Domtar)</p>

Section	Comments
3.5	<p>The "Possible Stakeholder Role" should be corrected to include IAS, which is a jointly owned subsidiary of the American and Canadian Gas Associations.</p> <p>(<i>Canadian Gas Association</i>)</p>
	<p>Important that industry be involved in the establishment of the standards.</p> <p>(<i>Canadian Industry Program of Energy Conservation</i>)</p>
	<p>We believe that this measure may be workable for small, off the shelf package boilers and heaters using fixed fuel types and known operating parameters. However, large industrial boilers and heaters are, as a rule, custom designed. This would make categorization and hence applicability for "standards" virtually impossible.</p> <p>(<i>Steel Environmental Association</i>)</p>
	<p>We challenge the scope of this measure. One of the proposed strategies to reduce NO_x from these boilers and heaters is not via NO_x control add-ons, but rather designed in energy conservation features.</p> <p>(<i>Dofasco</i>)</p>
3.6	<p>Higher capital cost allowances and reduced sales taxes as incentives for energy efficient industrial process investments should be effective in accelerative investment in new energy efficient equipment for industrial processes (e.g. boilers and electrical equipment).</p> <p>(<i>Canadian Cement Council</i>)</p>
	<p>Support this measure although some concern with the effects of new tax write-offs on the fiscal positions of governments.</p> <p>(<i>Canadian Industry Program of Energy Conservation</i>)</p>
	<p>We support this measure.</p> <p>(<i>Steel Environmental Association</i>)</p>

Section	Comments
	<p>There is a lack of financial and tax measures to stimulate uptake of conservation and alternative energy measures in the document. Tax measures that reduce the financial burden of purchasing conservation measures and alternative energy systems should also be considered. Various options are available including reduction or elimination of taxes on selected goods and services, R & D tax credits, accelerated depreciation, etc.</p> <p><i>(Enermodal Engineering)</i></p>
	<p>This measure's scope should be increased to include any retrofit that will allow equipment or processes to meet certain levels of efficiency.</p> <p><i>(Dofasco)</i></p>
4.1	<p>It seems that this section is addressing electrical appliances and equipment, but this is not explicitly stated, nor are the types of "utilities" in the "Possible Stakeholder Roles" stated.</p> <p>There seems to be no consideration in this section for the manufacturing requirement for North American standards.</p> <p>There is also no consideration in this section of the requirement for consumer acceptability. Consumer resistance, primarily because of high front end costs of high efficiency equipment, can be a major challenge.</p> <p><i>(Canadian Gas Association)</i></p>
4.2	
4.3	<p>Some of the manufacturers represented by the Canadian Gas Association have indicated that they would prefer that the program, if it proceeds, be situated as an "incentive" rather than "competitive" program.</p> <p><i>(Canadian Gas Association)</i></p>

Section	Comments
5.1	<p>Proposal to develop a National Green Transportation Strategy is a critical recommendation and could be the pivotal point for concerted actions by all levels of government.</p> <p>(<i>Canadian Urban Transit Association</i>)</p> <p>Drop the word "green" in all references to a National Transportation Strategy.</p> <p>(<i>GIRAPH Protective Technologies Ltd.</i>)</p> <p>The National Green Transportation Strategy proposal, and the Urban Transportation Demand Management Program have considerable potential, but they will require considerable cooperative and collective effort over a period of years to implement successfully.</p> <p>(<i>Metro Transit, Nova Scotia</i>)</p>
5.2	<p>Canadian Industry is committed to voluntarily reducing the amount of energy it uses to produce a given product, and in this way, to helping stabilize CO₂ emissions at 1990 levels by the year 2000.</p> <p>(<i>Canadian Industry Program for Energy Conservation</i>)</p> <p>We are concerned that the voluntary participation by the provinces may not lead to sufficient action across the country.</p> <p>(<i>Canadian Urban Transit Association</i>)</p> <p>It was recently learned that the State of Virginia has offered exemptions from mandatory inspections for natural gas fuelled and other clean fuelled vehicles. Such incentives, if offered in Canada, might enhance the acceptability of alternatively fuelled vehicles.</p> <p>(<i>Canadian Gas Association</i>)</p> <p>This is a fair measure since it applies to the entire range of vehicles and therefore is equitable for all consumers. We believe that consultation with dealers is imperative for a successful program.</p> <p>(<i>Ontario/Toronto Automobile Dealers Association</i>)</p> <p>National Urban Vehicle Inspection and Maintenance - move from Modelling Scenario 2 to 3.</p> <p>(<i>Nova Scotia Department of Natural Resources</i>)</p>

Section	Comments
	<p>The need for comprehensive consultation with the retail sector of the automotive industry on a provincial basis is the key to the success of this measure.</p> <p><i>(Federation of Automobile Dealer Associations of Canada)</i></p>
5.3	<p>See Motor Vehicle Manufacturers' Association comments as the AIAMC submitted the same comments.</p> <p><i>(Association of International Automobile Manufacturers of Canada)</i></p>
	<p>The funds from such a tax could be dedicated to fund the development of the National Green Transportation Strategy.</p> <p><i>(Canadian Urban Transit Association)</i></p>
	<p>We cannot support a gas guzzler tax. This form of taxation has proven to be extremely inefficient as it is a tax on new vehicles and does not address the older cars that are the major polluters. A gas guzzler tax also threatens to stall new car sales, ultimately delaying emissions reductions resulting from more efficient new cars. As a result, it is believed that this measure has little or no environmental benefit.</p> <p><i>(Federation of Automobile Dealer Associations of Canada)</i></p>
	<p>We continue to be seriously concerned about the risks of stalling new car sales and therefore, deferring emissions reductions as a result of tax-related increases in new car purchase prices.</p> <p>The "Guzzler" tax assessment interprets the term harmonization to include the multiplication of U.S. tax levels by the exchange rate. This assumption should be discussed. Further problems with this assumption are the variability in tax levels which it creates and the need to establish the precise exchange rate at the moment of sale.</p> <p><i>(Motor Vehicle Manufacturers' Association)</i></p>
	<p>Move from Modelling Scenario 3 to 2.</p> <p><i>(Nova Scotia Department of Natural Resources)</i></p>

Section	Comments
	<p>We can not support this measure as it is a blatant form of a tax grab and would have little impact. This measure does not address the older vehicles which are the major polluters.</p> <p><i>(Ontario/Toronto Automobile Dealers Association)</i></p>
5.4	<p>See Motor Vehicle Manufacturers' Association comments as the AIAMC submitted the same comments.</p> <p><i>(Association of International Automobile Manufacturers of Canada)</i></p>
	<p>There is no mention of rebates for alternative fuel vehicles that meet improved emissions standards well above those for conventionally fuelled vehicles.</p> <p>This measure makes mention of generating tax revenues for other specific measures. Special funds of this nature are difficult to establish and maintain in the Canadian government structure since they remove parliament's (or legislatures') control over tax money. [e.g. The Tire Tax introduced in Ontario a few years ago was singularly unsuccessful in accomplishing its purpose].</p> <p><i>(Canadian Gas Association)</i></p>
	<p>Strongly opposed to a National Feebate scheme. A feebate scheme by design distorts the market place and adds an additional level of retail based taxation. FADA advocates that environmental measures aimed at reducing emissions be as broad-based as possible, and not applied only to the retail sector. (An excellent example of a broad-base tax that would affect all emissions would be a carbon tax that raises the cost of not only transportation fuel but also residential and industrial fuel).</p> <p>One other major flaw with a feebate scheme is the arbitrary nature of its application, as it does not take into account vehicle utility. Why discourage a family from buying a 6 seatbelt passenger station wagon to carpool children, in favour of a smaller automobile unable to carpool. In the end, a feebate does not address the fundamental issue of kilometres driven and therefore is not environmentally feasible.</p> <p><i>(Federation of Automobile Dealer Associations of Canada)</i></p>

Section	Comments
	<p>Feebates are of concern to both vehicle buyers and vehicle manufacturers as they are deliberate intrusions into the normal rational product selection process and open market competition.</p> <p>Another concern is cross-border shopping if the fees and rebates are too aggressive. The high fees necessary to support generous rebates would drive Canadian buyers to the U.S. for desirable higher fuel consumption models.</p> <p>Feebates will not influence vehicle design, and should not be used to distort individual consumers basic vehicle characteristic requirements. This measure is an unwarranted and inappropriate interference in the market place.</p> <p><i>(Motor Vehicle Manufacturers' Association)</i></p>
	<p>Our Association strongly opposes a National Feebate Scheme. This program fails to recognize the unique needs of the consumer in acquiring transportation to meet the needs of their families or vehicle utility. It also could result in moving sales of vehicles from Canada to the U.S.</p> <p><i>(Ontario/Toronto Automobile Dealers Association)</i></p>
5.5	<p>There should be some consideration in any such program for conversion to alternative fuel, if cost-effective, rather than scrappage.</p> <p>The question which arises is whether the proposed measure has considered life cycle emissions or simply end-use: it may be better overall to keep older cars on the road when the emissions from the energy required to manufacture and market a replacement vehicle are considered.</p> <p><i>(Canadian Gas Association)</i></p>
	<p>A cooperative program with government, manufacturers and dealers to assist people in obtaining cleaner post-1987 vehicles has merit. However, a scrappage program must be subject to severe financial cost controls and the details of any successful plan must be coordinated with the industry.</p> <p><i>(Federation of Automobile Dealer Associations of Canada)</i></p>

Section	Comments
	<p>Consideration should be given to the following 2 factors:</p> <ul style="list-style-type: none"> - the energy consumption required to manufacture a replacement vehicle should be considered with, and weighed against, the fuel consumption required to keep the old vehicle running; - explore suitable means of disposal of old vehicles, including availability, re-use of existing parts and recycling of materials. <p>(N.H. Thyer - private interest)</p> <p>We support this measure as it would remove the older higher polluting vehicles from the road thereby having an immediate environmental impact.</p> <p>(Ontario/Toronto Automobile Dealers Association)</p>
5.6	<p>See Motor Vehicle Manufacturers' Association comments as the AIAMC submitted the same comments.</p> <p>(Association of International Automobile Manufacturers of Canada)</p> <p>There is no discussion concerning the provision of incentives for alternative fuel vehicles.</p> <p>(Canadian Gas Association)</p>
	<p>A tax on all forms of fuel (such as a carbon tax) would be more efficient than a Canadian Fuel Efficiency Premium as Part of Provincial Vehicle Registrations, because it would address fuel consumptions opposed to vehicle type.</p> <p>Any vehicle registration fee that does not take into account distance travelled will always raise questions of fairness.</p> <p>(Federation of Automobile Dealer Associations of Canada)</p>

Section	Comments
	<p>A measure such as this proposed registration surcharge, with the objective of reducing emissions (air quality & GHG related) would appear to be more soundly based on geography rather than on fuel consumption ratings. Many of the suggested measures are either not required in smaller cities, towns, etc., or are only viable when a critical mass is reached in terms of population or population density. These factors add further support to a geographically based registration surcharge rather than one based on fuel consumption ratings.</p> <p>The proposed method of calculating the fuel efficiency premium would further aggravate its inequities.</p> <p>The proposal to tie such increases to fuel consumption ratings as a proxy for emissions and/or efficiency is misleading and insupportable.</p> <p><i>(Motor Vehicle Manufacturers' Association)</i></p>
	<p>Our Association would be supportive of this measure since it spreads added taxes among a broader base rather than on new vehicle buyers exclusively. We believe a carbon tax is a more effective measurer since it addresses fuel consumption as opposed to vehicle type.</p> <p><i>(Ontario/Toronto Automobile Dealers Association)</i></p>
5.7	<p>Strongly support the process suggested, however, under the "Precedents" section, some mention might be made of the U.S. Clean Air Act amendments that mandate the use of improved or alternative fuels in vehicle fleets in targeted metropolitan areas.</p> <p><i>(Canadian Gas Association)</i></p>
5.8	<p>See Motor Vehicle Manufacturers' Association comments as the AIAMC submitted the same comments.</p> <p><i>(Association of International Automobile Manufacturers of Canada)</i></p>
	<p>The U.S. EPA indicated that their studies had concluded that there was no overall emission savings through improved vehicle fuel efficiency because of the increased mileage driven.</p> <p><i>(Canadian Gas Association)</i></p>

Section	Comments
	<p>Stress the need for governments to consult closely with manufacturers on this issue as they are best suited to deal with the technical aspects of such measures.</p> <p><i>(Federation of Automobile Dealer Associations of Canada)</i></p>
	<p>Despite the voluntary nature of the Corporate Average Fuel Consumption (CAFC) program in Canada, the national new car fleet average fuel consumption has typically been below the comparable U.S. average. The voluntary nature of the Canadian program does not appear to have been a liability.</p> <p>We are seriously concerned about the potential inequities which may result from the imposition of more stringent requirements through the CAFE/CAFC systems. Without structural changes, the burden of new demands would again fall almost entirely on MVMA members and would again provide importers with an unearned opportunity to expand their market share. Elimination of these inequities inherent in the present system should take precedence over agreement on revision of the numerical objectives.</p> <p>Some of the terminology and its usage in this section is confusing. Fuel economy and fuel consumption are used interchangeably although they are inverse terms.</p> <p>No explanation is offered as to the nature or format of incentives to manufacturers for continuing improvements.</p> <p>The structure of the new voluntary standards is not discussed, nor are the circumstances which lead to compliance.</p> <p><i>(Motor Vehicle Manufacturers' Association)</i></p>
5.9	<p>Does not mention offsetting incentives for alternative fuel vehicles.</p> <p><i>(Canadian Gas Association)</i></p>
	<p>Fuel prices relative to income levels are not increasing. There is scope for tax increases.</p> <p><i>(Canadian Urban Transit Association)</i></p>
	<p>We consider an increase in motor vehicle fuel prices, only, to be unfair. The question that governments must address is why Canadians can buy fuel to heat poorly insulated homes or outdoor pools at approximately half the price of motor fuel?</p> <p><i>(Federation of Automobile Dealer Associations of Canada)</i></p>

Section	Comments
	<p>We support continuation of voluntary targets for improvements in the fuel efficiency of their product offerings. However, because of the inability of the voluntary approach to cause a shift in individual behaviour, it appears that there must be some support by economic instruments, to cause the requisite shift in the choice of vehicle by consumers and patterns of vehicle usage across the entire fleet.</p> <p><i>(Motor Vehicle Manufacturers' Association)</i></p>
5.10	<p>See Motor Vehicle Manufacturers' Association comments as the AIAMC submitted the same comments.</p> <p><i>(Association of International Automobile Manufacturers of Canada)</i></p>
	<p>This item is a sales pitch for the ethanol industry. No mention of the studies on feasibility of ethanol plants and processes by the federal Department of Industry or the Province of Ontario. These studies were negative on the subject.</p> <p>If the goal of the National Action Program is to achieve 1990 or earlier emission levels in Canada, <u>ALL</u> alternative transportation fuels will need to be considered for incentives, not simply ethanol.</p> <p><i>(Canadian Gas Association)</i></p>
	<p>Government's work on fuel alternatives must be performed in concert with manufacturers. It must be ensured that alternative fuel programs are:</p> <ul style="list-style-type: none"> <input type="checkbox"/> as efficient and clean as gasoline; <input type="checkbox"/> technologically feasible and functional in the Canadian climate; and, <input type="checkbox"/> safe and reliable. <p>All major manufacturers are spending billions of dollars in R&D to overcome the problems associated with alternative fuels. It would be irresponsible of governments to mandate the sale of alternative fuel vehicles that are not safe and are economically unfeasible.</p> <p><i>(Federation of Automobile Dealer Associations of Canada)</i></p>
	<p>Suggestion: What if there were a funding program in place for the re-engineering or conversion of existing diesels over the next five years? The impacts for improving urban air emissions would be immediate, measurable and substantial. Upgrades are part of the normal transit re-build procedures in many cities, but the potential for a concentrated, consistent <u>national bus engine upgrade program</u> is considerable.</p> <p><i>(Metro Transit, Nova Scotia)</i></p>

Section	Comments
	<p>Use of hydrogen as a vehicle fuel should be researched and developed if practicable.</p> <p><i>(N.H. Thyer - private interest)</i></p>
	<p>We support the principle of providing incentives for launching those fuels which offer environmental benefits and have the long term potential of being viable economically on a competitive basis with conventional motor fuels.</p> <p>An area of concern in this measure is the promotion of ethanol gasolines. The OECD 1993 report indicates high fossil fuel usage and GHG emissions in ethanol production from corn.</p> <p>If funds are available they should be directed toward the development of practical and economic processes for the production of ethanol from biomass.</p> <p>California emissions surveillance data, recently confirmed by British Columbia emissions testing, shows that use of gaseous fuels does not automatically produce superior emissions performance and may in fact, result in greater pollution than conventional fuels.</p> <p><i>(Motor Vehicle Manufacturers' Association)</i></p>
5.11	<p>See Motor Vehicle Manufacturers' Association comments as the AIAMC submitted the same comments.</p> <p><i>(Association of International Automobile Manufacturers of Canada)</i></p>
	<p>Would hope that this labelling would be more self explanatory than the labelling now used on appliances.</p> <p><i>(Canadian Urban Transit Association)</i></p>
	<p>Redundant efforts in this area would not be supported. It should be noted that at the present time, vehicles have an underhood or driver's door mounted label attesting to certification to applicable emissions regulations and a fuel consumption label (often part of a price model label) affixed to the rear window.</p> <p><i>(Federation of Automobile Dealer Associations of Canada)</i></p>

Section	Comments
	<p>We have been and continue to be supportive of vehicle labelling as a means of informing consumers of model characteristics pertinent to their selection of a vehicle meeting their needs.</p> <p>We cannot support an emission index of individual models system or labels based on certification test results, for a number of reasons: the construction of an index will be difficult; the emissions index approach faces a huge challenge to even get the public's attention, to convey an understanding of the system and eventually apply the measure.</p> <p>We cannot support the addition of a GHG emissions index as it will be misunderstood and meaningless to potential buyers and is likely to create confusion and discourage those seeking fuel consumption information.</p> <p><i>(Motor Vehicle Manufacturers' Association)</i></p>
	<p>Why not have just a fuel consumption labelling program as is done by some manufacturers now, or a fuel consumption and emissions labelling program. Many consumers can relate a fuel consumption rating to cost of operation, but may have more difficulty relating to an emissions rating.</p> <p><i>(Nova Scotia Department of Natural Resources)</i></p>
5.12	<p>The consideration that advance fuels have to be non-fossil is not understood.</p> <p><i>(Canadian Gas Association)</i></p>
	<p>Explore the potential of using hydrogen as a vehicle fuel.</p> <p><i>(N.H. Thyer - private interest)</i></p>
5.13	<p>The CHBA supports the goal of more compact urban environments and agrees with the rationale. However, this issue is complex and the goals are hard to achieve.</p> <p><i>(Canadian Home Builders' Association)</i></p>

Section	Comments
	<p>Clearly a major issue which has long term impact on the forms and modes of transportation required. This should be a key element of the Urban Transportation Demand Management Program along with short term measures.</p> <p><i>(Canadian Urban Transit Association)</i></p>
	<p>Preservation of rail corridors is desirable in some rural areas, both as transport for rural residents who commute to town and for transport of materials for local industries.</p> <p><i>(N.H. Thyer - private interest)</i></p>
5.14	<p>Many employers, including governments, are reluctant to allow telecommuting and alternative work patterns, or else they are unaware of their advantages. They need to be informed of the advantages, and incentives may be necessary for their implementation.</p> <p><i>(N.H. Thyer - private interest)</i></p>
5.15	<p>Encourage this measure in communities of all sizes.</p> <p><i>(N.H. Thyer - private interest)</i></p>
5.16	<p>No mention in this item of the fact that emissions could be further reduced through conversion of public transit fleets to alternative fuels.</p> <p><i>(Canadian Gas Association)</i></p>

Section	Comments
	<p>Total annual ridership on all public transit systems in Canada has declined by 11% between 1986 and 1992, due to the following reasons:</p> <ol style="list-style-type: none"> 1. Economic downturn - several years of recession have resulted in unemployment, reduced shopping, personal entertainment travel; 2. Competition from auto industry - stable gasoline, parking and financing costs have supported the continued dominance of private autos; 3. Changing demographics and development patterns - growing suburbanization and the aging population; new industrial parks, business parks and suburban shopping centres proclaim the benefits of plentiful parking and easy auto access. <p>(Metro Transit, Nova Scotia)</p>
	<p>Encourage this measure in communities of all sizes.</p> <p>(N.H. Thyer - private interest)</p>
5.17	<p>Encourage this measure in communities of all sizes.</p> <p>(N.H. Thyer - private interest)</p>
	<p>Promote Ridesharing - move to Modelling Scenario 1.</p> <p>(Nova Scotia Department of Natural Resources)</p>
5.18	<p>Truck transport is at present cheaper than rail transport, even though it is less energy-efficient. Truck traffic causes major wear-and-tear on roads, and should be charged accordingly.</p> <p>(N.H. Thyer - private interest)</p>
5.19	

Section	Comments
5.20	
5.21	<p>This draft report contains some very misleading information. For example, the efficiency of long haul passenger travel by train is erroneously reported as an inefficient means of transport due to such trains requiring dining and sleeping facilities. The presentation in this report (the source seems to be Transport Canada), is <u>very biased</u>.</p> <p>It is equally misleading to rank short-haul regional travel from highest to lowest showing passenger rail fourth after bus, auto and air! The <u>Environmental Impact Study for the Pearson Airport</u> has shown the futility of fighting pollution with planes. To say that private automobiles are more efficient than trains is ludicrous.</p> <p>Where is the incentive or means to attract a modal shift to rail as long as a subsidized road system (approximately \$1 billion per year) is free to effectively distort the freight or passenger market?</p> <p>(Transport 2000 Ontario Inc.)</p>
5.22(a)	<p>See Motor Vehicle Manufacturers' Association comments as the AIAMC submitted the same comments.</p> <p>(Association of International Automobile Manufacturers of Canada)</p>
	<p>We are seriously concerned about the transportation cost impact on vehicle prices and competitiveness of all Canadian industries.</p> <p>As the report noted, traffic congestion is a major cause of inefficient fuel due to continuous speed variations. Increased congestion in many areas is a greater cause of inefficiency than speed.</p> <p>We believe that the most effective overall strategy will be one that concentrates on relieving congestions and creating steady speed patterns on highways. Posted speed limits should more realistically reflect the actual safety experience of different road types and locations. Implementation of these approaches will avoid the devastating political and economic impact of 80 km/hr limits on limited access and other primary highways.</p> <p>(Motor Vehicle Manufacturers' Association)</p>

Section	Comments
5.22(b)	
6.1	<p>The statement "... Western utilities have no direct access to nuclear generation capacity ..." is incorrect. In the case of new supply options, Measure 6.9, Western utilities have as <u>much access</u> to nuclear generation as any other Canadian utility.</p> <p><i>(Ontario Hydro)</i></p>
	<p>All costs relating to environmental compliance, including any return on such investments, are paid by the utility's customers. It is not that this is necessarily wrong, but it often seems to be forgotten exactly who is paying the bills.</p> <p><i>(Nova Scotia Utility and Review Board)</i></p>
6.2	<p>This item makes no attempt to integrate natural gas use into electric utility resource planning.</p> <p><i>(Canadian Gas Association)</i></p>
	<p>The least-cost concept is simple, legislation should provide the flexibility of meeting either an annual emissions cap or an "<u>equivalent cumulative emissions bubble</u>". A cumulative emissions bubble would ensure that over a planning horizon the utility would not exceed, on a cumulative tonnage basis, what it would have emitted under the annual emissions cap. This system would protect customer rates from huge economic waste that a pure annual emissions cap strategy would impose, while meeting CO₂ targets on a cumulative basis.</p> <p>Environmental compliance is a given, and part of the world in which all businesses operate. Because utility customers are prisoners of a monopoly supply situation, regulators should not be asked to sweeten up an already (public process defined) adequate and almost guaranteed return on equity.</p> <p><i>(Nova Scotia Utility and Review Board)</i></p>

Section	Comments
6.3	<p>Standardization of the name of the challenge program and the National Action Plan (or Program?) would be helpful.</p> <p>Given the fact that the term "utilities" encompasses many sectors (gas, electricity, telephone, water, etc.) it is recommended that the use of the term "utilities" to mean strictly "electrical utilities" be avoided.</p> <p><i>(Canadian Gas Association)</i></p> <p>Ontario Hydro has established programs to internalize energy efficiency as an element of its "Strategy for Sustainable Energy Development and Use for Ontario Hydro".</p> <p><i>(Ontario Hydro)</i></p>
6.4	<p>No mention is made of DSM (Demand Side Management) programs for the gas utilities.</p> <p><i>(Canadian Gas Association)</i></p> <p>The following two proposals, one on page 85, "The adoption of IRP (Integrated Resource Planning) will be assessed ..." and the other on page 87, "Electric utilities will investigate and implement cost" seem to forget that the term Integrated Resource Planning combines Least-Cost Planning from the supply-side with Demand-Side Management, thus an IRP would be expected to be the least-cost way (supply-side and demand-side) to meet the requirements of providing electricity to customers while meeting environmental legislation.</p> <p>With an appropriate system of emission credits in place, the economics of more overall efficient electrotechnologies and of district heating will be given the appropriate priority within the IRP process.</p> <p>Re: September 1993 report by Haites: A lot of utility customers' money has been wasted on DSM incentives that have proven after the fact to be inappropriate and ineffective. Market transformation is seen as a process whereby permanent changes can be made regarding efficient energy utilization and at reasonable costs. Proposals to continue to spend very large sums of money on an outdated resource acquisition approach to DSM reflects nothing but a lack of sophistication in the planning exercise.</p> <p><i>(Nova Scotia Utility and Review Board)</i></p>

Section	Comments
6.5	<p>Requiring fossil fuelled and nuclear generating stations to improve their efficiency by installing back pressure turbines is important.</p> <p><i>(GIRAPH Protective Technologies Ltd.)</i></p>
6.6	<p>Remove the paragraph under "Technical" as to whether there is sufficient pipeline capacity to meet potential demand for natural gas from fuel-switching. This is a red herring that is inappropriate in this Report. If the demand for natural gas is there, it will be met.</p> <p><i>(Canadian Gas Association)</i></p>
6.7	<p>Nuclear units, at present, provide only base load; they cannot be used as peaking units.</p> <p><i>(Ontario Hydro)</i></p> <p>This measure suggests increasing the use of nuclear generation. We should not adopt measures to reduce greenhouse gases that result in exchanging one environmental hazard for another. We should question the acceptability of increasing nuclear capacity.</p> <p><i>(Saskatchewan Environmental Society)</i></p>
6.8	<p>The Measure does not present a discussion of the technical or environmental issues associated with NUGs.</p> <p>The need for full fuel cycle assessments of non-utility generation should be identified. The promotion of NUG, or any other fuel or generation option is not acceptable without properly defining the basis for comparison.</p> <p><i>(Ontario Hydro)</i></p>
6.9	<p>Consideration should be given to hydro-electric power generation of the type that causes minimal environmental disruption. This could include run-of-the-river projects that do not require dams and major flooding. At times of high flow and low demand, surplus power could be used to produce hydrogen.</p> <p><i>(N.H. Thyer - private interest)</i></p>

Section	Comments
	<p>Surely, we must realize by now that electrical energy will be the dominate energy supply for the future and that nuclear is well on its way in becoming the dominate method of producing the much of the needed electricity for the future.</p> <p>(R.E. Tweeddale, P. Eng. - private interest)</p>
6.10	<p>Under "Considerations:" (starting with "The transportation sector...") is misleading and incomplete. ALL of the gas pipeline members of CEPA are also members of CGA. This paragraph should thus be corrected or deleted.</p> <p>(Canadian Gas Association)</p>
6.11	
6.12	
6.13	
6.14	<p>Move from Modelling Scenario 3 to 2.</p> <p>(Nova Scotia Department of Natural Resources)</p>
6.15	<p>Stimulate Renewable Energy Markets - move to Modelling Scenario 1.</p> <p>(Nova Scotia Department of Natural Resources)</p>

Section	Comments
6.16	<p>Reference in this item to CGA developing standards may be inappropriate.</p> <p>(Canadian Gas Association)</p>
6.17	<p>This item starts with reference to "electric and gas utilities" being involved, but the rest of the narrative does not indicate what role, if any, would be played by gas utilities.</p> <p>(Canadian Gas Association)</p>
6.18	<p>If tree growth potential in Nova Scotia and other parts of Canada is found to be suitable, such generating plants would serve as a direct path to reducing emissions and provide huge economic spin-off benefits to the forestry and service sectors.</p> <p>(Nova Scotia Utility and Review Board)</p>
7.1	
7.2	
7.3	<p>There is no mention in this section of natural gas cooling as an excellent alternative to methods using ozone depleting substances.</p> <p>Request that reference to gas cooling as an alternative be included in this section. It also has the potential to reduce emissions, where displacing units powered by electricity generated from coal.</p> <p>(Canadian Gas Association)</p>

Section	Comments
7.4	<p>With reference to the first paragraph of the summary, we would question the percentage of PFC emissions attributed to aluminum smelters. Is the precise figure of 1.15% the result of scientific analysis? We would like to know what your sources are, since the Canadian industry is currently conducting a study to determine this same percentage. Our preliminary results indicate a figure of less than 1%. Therefore, we suggest that no figures be mentioned until studies have been completed.</p> <p>In the third paragraph, it is not accurate to claim that "...older aluminum smelters using horizontal stud Soderberg (HSS) technology tend to emit 30% to 60% more PFCs than those using the newer 'Prebake' anode technology." Currently available information shows that PFC emissions are much more related to the way cells operate than the technology used. Moreover, measurements show that the horizontal stud Soderberg cells have very low emissions because the anode effects are carefully controlled.</p> <p>As soon as the problem of PFCs was raised in scientific circles, the Canadian aluminum industry suggested to Environment Canada and the Quebec Department of Wildlife and the Environment that it take part in studies and programs to measure polyfluorocarbons. The quantity and quality of work carried out so far and the close cooperation that has developed among the parties should, in our opinion, be mentioned in this section of the report. Each of the stakeholders should receive credit for work done and work in progress.</p> <p>We believe that, before setting reduction targets, passing new regulations or proposing different kinds of measures, it would be important and even essential that overall PFC responsibility for the greenhouse effect be reassessed while the voluntary reduction program is being set up.</p> <p><i>(Aluminum Industry Association)</i></p>
7.5	
7.6	<p>While the initiatives suggested are supported, it should be noted that re-injection of CO₂ into wells requires energy to carry out this process.</p> <p><i>(Canadian Gas Association)</i></p>

Section	Comments
7.7	<p>It might be useful to highlight the fact that tree planting has been an active environmental program of Canadian industry for some time (see <i>Canada and Global Warming - Meeting the Challenge</i>, p. 26, an Environment Canada Publication distributed to attendees of the UNCED).</p> <p>Friends of the Earth (Ottawa) sponsored Global Releaf, a program that involved the promotion of tree planting for energy conservation. An update on their success with this effort would be interesting.</p> <p>(Canadian Gas Association)</p>
7.8	<p>Opposed to the inclusion of "substitute wood products for steel and concrete in the commercial building sector" - for the following reasons:</p> <ul style="list-style-type: none"> - this measure must be deleted at least until the referenced study has been completed and evaluated by the construction industry. - since concrete is not even used for studs, any conclusion or reference to concrete is unjustified. - it is inappropriate for this report to provide such a strong endorsement for one Canadian material over another without adequate technical substantiation. <p>(Canadian Cement Council)</p>
	<p>Some mention should be made about the rapid improvements in energy efficiency in Canadian energy.</p> <p>(Canadian Gas Association)</p>
	<p>We strongly oppose this measure. The building industry should be the ones to evaluate the consequences of alternative materials in their applications. It would be wrong, unfair and impossible for the federal government to generalize conclusions as to the superiority of one material over another in every building application.</p> <p>(Steel Environmental Association)</p>

Section	Comments
	<p>We oppose this measure which apparently has a scope limited to the commercial building sector. The proposed measure is misleading, in its leap from the use of the preliminary results of a steel wall/wood wall example (to demonstrate model usefulness) to the assumption that wood is a more environmentally friendly material in all designs for all applications.</p> <p>Steel framed buildings begin life as energy efficient as wood framed buildings, but remain so as the steel framing suffers no degradation (warping, twisting) with age, nor expansion with moisture (seasonal).</p> <p>The building industry should be the ones to evaluate the consequences of alternative materials and their applications. It would be wrong, unfair and impossible for the Federal Government to generalize conclusions as to the superiority of one material over another in every building application (especially based on what appears to be illustrative examples of a model still in development).</p> <p>We support the development of tools based on sound scientific knowledge and principles.</p> <p>Measure 7.8 should be removed from the National Action Program on Climate Change.</p> <p><i>(Dofasco)</i></p>
7.9	
7.10	
7.11	
7.12	
7.13	

Section	Comments
7.14	
7.15	
7.16	
7.17	
OTHER SUGGESTIONS	
	<p>Report should include a discussion or definition of energy intensity, energy efficiency, economic efficiency and the implications for a country such as Canada, which exports a great deal of its energy use to other countries in the form of processed or semi-processed products.</p> <p>A National Program for Industrial Consultations to promote Energy Efficiency should be put in place.</p> <p>An International Industrial Energy Efficiency Conference should be organized by CIPEC.</p> <p>There seems to be a fixation on only the CO₂ stabilization goals. Other equally important goals such as: economic growth, job creation, etc., need to be established against which the impact of greenhouse gas reduction initiatives can be measured.</p> <p><i>(Canadian Industry Program of Energy Conservation)</i></p>

Section	Comments
	<p>If the National Action Program on Climate Change could launch the program, ACHIEVING THE TRANSIT VISION, it would lay the ground work for the actions to follow in the Green Transportation Strategy and the Urban TDM program.</p> <p>Amend the Income Tax Act so that it would provide up to \$x per month to be tax free for the issuance of employer provided transit passes. This would send a positive signal about the importance of Climate Change actions, and stimulate local marketing efforts to promote employer sponsorship of transit passes.</p> <p>The Canadian Council of Environment and Energy Ministers should provide leadership to establish a uniform transit assistance program aimed at reducing Greenhouse Gas Emissions, such as in capital funding for new bus purchases.</p> <p><i>(Metro Transit, Nova Scotia)</i></p>

